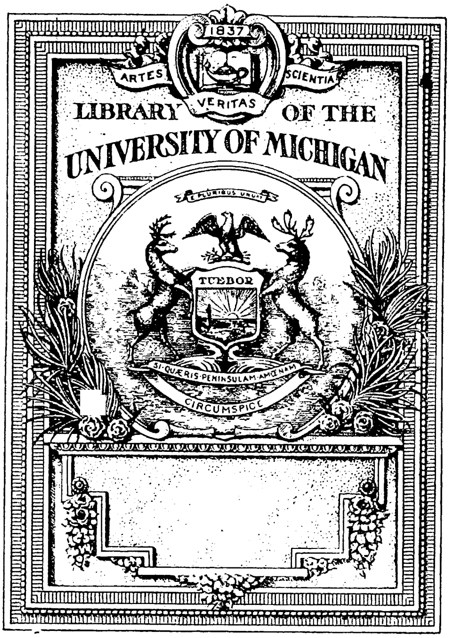
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THE

LONDON JOURNAL

OF

Arts, Sciences, and Manufactures,

AND

REPERTORY

OF

PATENT INVENTIONS.

CONDUCTED BY

MR. W. NEWTON,

OF THE OFFICE FOR PATENTS, CHANCERY LANE.

(Assisted by several Scientific Gentlemen.)

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No. CCXXIV.

RECENT PATENTS.

To Charles Edwards Amos, *of the Grove, Southwark, in the county of Surrey, engineer, and* Moses Clark, *of St. Mary Cray, in the county of Kent, engineer, for improvements in the manufacture of paper, and in the apparatus and machinery used therein; part of which apparatus or machinery is applicable for regulating the pressure of fluids for various purposes.*—[Sealed 10th November, 1849.]

In making writing or other papers, where smalts, ultramarine, or other colors are used, considerable difference is generally found in the tint of the paper when the two sides are compared: thus, the under side will appear of darker color than the upper surface, by reason of the coloring matter sinking to the lower side, by the natural subsidence of the water, or from the extraction of the water by the suction-box. To obviate this imperfection in the manufacture of colored or tinted papers, the patentees employ, in place of the common upper couch-roll (for working against the upper surface of the paper), a hollow roll, perforated on its surface, and having a suction-box within it, acted upon by an air-pump. The mode of making this hollow roll, and the method of applying the suction, will be well understood without further description.

Under this head of the invention, they claim the application of a perforated hollow roll, having a suction within it, for the purpose of drawing off water from the upper side of

the paper, and thereby equalizing the tint on both sides of the paper.

The second head of the invention, which consists of an improved knotter or pulp-strainer, is shewn in Plate I., at figs. 1, 2, and 3. Fig. 1, is a front elevation of the pulp-strainer; fig. 2, is a transverse section on the line A, B, of fig. 1; and fig. 3, is a transverse section on the line C, D, of the same figure,—the sieve-plate being removed. The sieve-plate or knotter, with its frame, may be made in the usual manner. The improvement consists in the mode of getting the pulp through the plates. *a,* is the outer frame or box, resting on the end frames *b, b.* *c,* is a belt of vulcanized India-rubber, passing all round the outer frame or box *a,* and projecting some little distance within its frame: the belt *c,* rests upon a sheet *d,* of gutta-percha, leather, or of vulcanized India-rubber,—the latter having plies of canvas worked within it. The belt *c,* and the sheet of gutta-percha *d,* are held fast to the outer frame or box *a,* and a water-tight junction is made by the bar *e,*—bolts being passed through the whole of them, to keep them together. A piece of wood *f,* is fastened beneath the box, having a pipe *g,* passing through it, for the purpose of carrying off the strained pulp to the vat. Two wooden boards or clappers *h,* and *i,* are fastened to and beneath the flexible sheet *d;* and the two clappers are united together by means of two bars *j,* and j^1, which are bolted to them. Connecting-rods attach the clapper-bars *j,* and j^1, to the levers *k,* k^1; and an alternate rising and falling motion is given to them from the shaft *l,* through a crank *m,* on the face of the fly-wheel *n;* which crank is coupled by the connecting-rod *o,* to the lever *k.* The radius of the crank *m,* can be varied at pleasure. P, is a flat horizontal spring, bolted to the framing *b,* and intended to balance the weight of the levers *k,* k^1. From the end of this spring a rigid rod *q,* is pendent, for the purpose of connecting the spring *p,* with the lever k^1. The sieve-plate or knotter A, with its frame S, is placed in the outer frame or box *a,* and fastened down by the bolts *r, r,* upon the elastic belt *c,*—and thus a water and air-tight joint is formed.

The pulp to be strained is admitted on the upper side of the sieve-plates A, fig. 2, as usual; and a partial vacuum and plenum is alternately produced beneath the sieve-plates, by the rising and falling of the clapper-boards *h, i.* The pipe *g,* is carried into the bottom of the vat, which is usually placed before the "wire" of the paper-machine; and a cock, of common construction, is usually placed in this pipe, be-

tween the sifter and the vat, for the purpose of regulating the degree of vacuum required beneath the sieves.

Under this head of the invention, the patentees claim the combination of the parts as herein described, whereby pulp may be sifted in a more expeditious and satisfactory manner than heretofore;—lumps and blue spots being thereby, in great part, avoided in the manufacture of paper. They also claim the drawing off of the stuff or pulp at the lowest part of the knotter, when the bottom of such knotter is made moveable, for the purpose above described. And, lastly, the mode of fastening the sieve-frame down upon a flexible material, which admits of the ready removal of the sieve and its frame from the outer box, when the sieve requires cleansing.

In heating the drying-cylinders for drying the paper by steam, it is known that this operation is better effected when a varying pressure is given to each cylinder: thus the cylinder which receives the paper first is preferred to be cooler than the following one,—the second cylinder cooler than the third,—and so on. The character of the paper, when dried under such circumstances, approaches more nearly to the "loft-dried paper,"—it being tougher in quality, and without the harshness of machine-made papers when dried in the usual way. The usual mode of regulating the steam pressure in the cylinder has been by the common steam-cocks; but, as this is attended with much uncertainty, the patentees propose to employ a pressure-regulating-valve, for regulating at pleasure the pressure in the cylinders. This valve is shewn in sectional elevation at fig. 4, wherein A, is a cylinder, having a piston B, nicely ground and fitted, working within it. C, is the piston-rod, passing loosely through the crown of the cylinder, and carrying a weight D. E, is the valve-seat, being a hollow cylinder, having four or more ports or openings in its periphery; three of which ports are shewn at *a*, *a*, *a*. F, is the valve, being a cylindrical ring of metal, which is made to slide on the valve-seat E, by means of the connecting-rods G, and G^1, which couple it with the piston B, by the cross pin *b*. H, is a cylinder or steam-box, having the upper cylinder A, bolted to it; and the cylinder or valve-seat E, passing through it, is secured in its place by the nut *e*. The valve-seat E, is attached by the pipe J, to the pipes leading from the steam-boiler; and the pipe I, leads from the steam-box H, to the drying-cylinder. One of these regulating-valves is required for each drying-cylinder. When the weight D, is in its lowest position, as in the figure, the sliding-valve F, is also at its lowest position, and the ports *a*, *a*, *a*, are open;—thus allowing the steam

to pass from the boiler into the drying-cylinder in the direction of the arrows. When the pressure in the drying-cylinder and in the steam-box H, exceeds the resistance offered by the weight D, to the piston B, the piston will be raised by the pressure of the steam, and thereby carry up the sliding-valve F, and close the ports *a, a, a,* to the proper degree for the pressure required, which is, when that pressure and the resistance from the weight D, are in equilibrium. When the piston B, rises sufficiently to bring the surfaces c, c^1, of the sliding-valve F, in contact with the surfaces d, d^1, of the valve-seat E, the openings *a, a, a,* will be closed, and no steam can pass from the boiler through the pipe I, to the drying-cylinder in connection therewith. By placing weights of different sizes upon the pressure-regulating-valve of each drying-cylinder, any required pressure of steam can be maintained therein. This regulating-valve is useful for, and may be applied to, various purposes,—as, for instance, where steam of any high or varying pressure is required to be reduced to an uniformly low pressure. The valve will be also useful in reducing the pressure of columns of water (as when attached to a high-service main), and obtaining an uniformly low pressure. The pressure of air, gas, and other fluids, may be in like manner regulated by this valve when required.

The patentees claim the construction and arrangement of valve, as above described and shewn in the drawing, for the purpose of regulating the supply of steam to the drying-cylinders of paper machinery; and also the application of this improved construction of regulating-valve for the purpose of regulating the pressure of fluids generally.

As an improvement in the manufacture of paper, sized by the machines now in use, the patentees propose to conduct the web of paper, after it has been either partially or completely dried, through a trough of cold water, then to pass it through a pair of pressing-rolls, and afterwards to dry it on reels, or over hot cylinders. The paper thus treated will be found to "bear" much better, and admit of erasures being made on the surface of such paper, and written over, without the ink running in the way it does when the paper is sized and dried in the usual manner.

The patentees claim the dipping or passing of machine-sized papers through cold water, after being dried or partially dried for the purpose above set forth.

It has been found that when paper is dried, after sizing, by the drying-machines in present use, the paper is very harsh, and, until it stands for some time to get weather (as it is

technically termed), great difficulty is experienced in glazing the paper. This inconvenience is proposed to be overcome by passing the paper partially round a hollow cylinder, through which a small stream of cold water is made to run. By this means the heat in the paper is carried off, and the paper is rendered more tractable, and brought to a proper state for undergoing the glazing operation.

The patentees claim the passing of papers (after they have gone through the drying-machine) partially round a cylinder through which cold water is made to run, for the purpose above set forth.

The patentees, in commencing the description of that part of their invention which refers to improved machinery for cutting paper, state, that the many improvements which have of late been effected in paper-making machines, admit of their being worked at a much greater velocity than heretofore, and hence great inconvenience has been experienced with the paper-cutting machines in general use, as they cut the sheets of paper in very irregular lengths, when working at a speed necessary to keep up with the paper-making machine. To overcome this difficulty the patentees have invented a machine, the construction of which will be clearly understood from the following description thereof:—

Fig. 5, shews a side elevation of the improved machine; fig. 6, is an elevation of the opposite side thereof; fig. 7, is an end view, taken at the back part of the machine, where the paper is delivered; and figs. 8, and 9, are diagrams, shewing the gathering-roll, and the action of the parts in connection therewith. Motion is given to this machine by the shaft A, from any prime mover; and the shaft B, is driven by a strap, passing round the conical drums C, and D, mounted respectively on these shafts. The shaft B, carries the crank *a*, the excentric *b*, and b^1, and the rigger or band-wheel E; which latter is for the purpose of driving the fly-wheel E*, and thereby steadying the motion of the machine. This rigger E, has a plate, with staple-headed projections cast on its outer side; and through these projections the crank-arm Z, passes, and is retained in any required position by the set-screws *d, d.* A means is thus presented of altering the radius of the crank, to admit of sheets of paper being cut to any required length. The rotary motion of the shaft B, gives a reciprocating motion to the gathering-drum F, through the connecting-rod *e*, which is coupled to the crank-pin of the crank-arm Z, at one end, and to the lever *f*, at the other; which lever is keyed upon the shaft of the drum F. Above the gathering-drum F, the rollers

g, and g^1, work in bearings in the cross-head G. An alternate rising and falling motion is given to these cross-heads and rollers by the excentrics b, and b^1, on the shaft B, through the connecting-rods z, and z^1, the levers h, h, and the vertical bars i, i; which bars work through guides, fastened upon the side-frames of the machine. A presser H, is suspended to the side-frames of the machine by the right-angled levers J, and J^1; and an alternating motion is given to it, in order to make it approach to and recede from a stationary presser-board T, (see fig. 8,) and lay hold of the paper as it descends from the drum F, to be divided into sheets by the cutters. When the levers h, descend, a pin k, on each side of the machine, presses upon the forked ends of the connecting-rods l, and thereby causes the end m, of the right-angled levers J, and J^1, to descend, and carry the presser H, away from the presser-board T. As the levers h, ascend, the presser H, is brought back by the springs n, (one placed on each side of the machine, and connected to the presser by the connecting-rods o). I, is the fixed horizontal knife, fastened to the side frames; and the moveable knife K, is suspended to the side frames by the rods P, and P^1. Motion is given to this knife by the crank a, the connecting-rod q, the levers r, r^1, and the connecting rods s, s^1. The combined motion of these rods and levers admits of the moveable knife remaining nearly quiescent for a given time; then, speedily closing on the fixed knife I, it moves over the edge thereof, cutting whatever may be between the knife-edges, in the same manner as a pair of shears. The sections figs. 8, and 9, shew more clearly the gathering-drum F, the rollers g, and g^1, the guide-roller t, the moveable presser H, and a fixed presser-board T, which forms with H, the press for holding the paper.

The paper to be cut passes over the front rollers 1, and 2, between the circular knives 3, and beneath the tension-roll 4, in the usual manner. It then passes over the gathering-drum F, and beneath the rollers g, and g^1, (which press upon the drum when the paper is being carried forward); and then under the guide-roll t, and between the pressers H, and T, which, during the progress of the paper, are open to receive it.

The operations peculiar to this machine will be best understood by reference to figs. 8, and 9:—the arrow, fig. 8, shews the direction the paper is travelling. When the crank-arm Z, arrives at the line of centres (as shewn at fig. 6), the pressers H, and T, are closed, the rollers g, and g^1, have begun to rise, and the motion of the gathering-drum F, is reversed;—it being made to turn in the direction of the arrow, fig. 9. During

the time the pressers H, and T, are closed, the moveable knife K, is drawn inwards, and the length of paper pendent from the pressers is cut off. As the gathering-drum makes its backward movement in the direction of the arrow, fig. 9, it smooths out the paper upon its surface, which is now held between the pressers H, and T; and the tension-roll 4, takes up the slack in the paper until the motion of the drum is again reversed. Motion being now communicated to the drum F, in the direction of the arrow, fig. 8, and the rollers g, g^1, being again brought into their lowest position, a further length of paper will be drawn forward, ready in its turn to be laid hold of by the pressers, and finally cut off into a sheet. When it is required to cut a short sheet, to bring the water-mark more into the centre of the sheet of paper, the action of the tension-roll 4, is stopped by the pall *u*, being brought into contact with the ratchet-wheel *v*:—this is effected by the handle *w*. The handle *x*, (shewn in figs. 5, and 6,) is for moving the strap on the conical drums; and the board *y*, is merely a stage, to enable the attendant to pass the paper through the machine more readily.

The patentees claim, as their improvements in paper-cutting machines, Firstly,—conveying the paper to the cutters by means of the reciprocating gathering-drum F, and the rising and falling rolls g, and g^1. And, Secondly,—the mode of preventing the paper from being drawn back by the return motion of the drum F, and of presenting it to the action of the cutters, to be divided into sheets, as above described.

In glazing papers with copper plates it has been found that, through the curvature of the rolls, the pile of paper between the copper plates is sometimes disturbed, and the edges become frequently blackened in consequence. To obviate this defect, the patentees employ rolling-machines of the construction shewn at fig. 10. This figure shews, in section, three pairs of hollow pressing-rollers, but more or fewer pairs may be used, if required. Between these rolls, which are suitably mounted, a wrought-iron plate, for carrying the pile of papers to be glazed, is made to traverse, by means of a reversing motion with which the rolls are provided. *a, b, c, d, e,* and *f*, indicate the three pairs of rolls; *g*, is the metal plate; and *h, i,* shew the piles of paper, with their layers of copper plates or glazed boards, as usual. *j, k, l,* are three wheels, keyed upon the rolls, and driven by the pinion *m*, (from any prime mover);—the wheel *j*, is keyed on the roll *a*, the wheel *k*, on the roll *e*, and the wheel *l*, on the roll *c*. The pinion *m*, works into the wheel *k*. On the opposite side of the

machine (but not shewn in the drawing) other wheels, of similar diameters, are placed on the rollers *b*, *d*, and *f*; and a similar pinion to *m*, and keyed on the same shaft, works into the wheel keyed on the roll *f*; by which arrangement the whole of the rolls are driven in the proper direction.

The patentees claim the glazing of paper by the employment of a traversing horizontal table, in conjunction with two or more pairs of rolls, as above described.—[*Inrolled May*, 1850.]

To Alfred Vincent Newton, *of the Office for Patents*, 66, *Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of pipes or tubes,—being a communication.*—[Sealed 5th October, 1849.]

The nature and advantages of this invention of improvements in the manufacture of pipes or tubes will be clearly understood from the following explanation:—

Whereas, in the usual methods of moulding, a large amount of labour is consumed in what is called ramming the moulding-sand (which ramming is performed by persons who require long practice to enable them to compress the sand to the proper degree to produce a good casting); and whereas, in the usual methods of making cast pipes, the cores thereof require a long drying previous to being placed in the moulds; now, the nature of this invention consists, first, in performing the operations of ramming the moulds and the cores, by machinery, which can be attended and worked by persons unskilled in the art of moulding; and secondly, in a peculiar construction of the core-spindle, which precludes the necessity of drying the core before the melted metal is poured into the mould.

In Plate II., figs. 1, 2, and 3, represent various views of the press for forming the mould which gives shape to the outer surface of the pipe; figs. 4, 5, and 6, shew the press for forming the core which gives shape to the inner surface of the pipe; fig. 7, is a view of the improved core-spindle; and figs. 8, 9, and 10, shew the arrangement for pouring the moulds.

The general action of the press for forming the mould (represented in figs. 1, 2, and 3,) is as follows:—The half of the flask is placed upon a carriage, and passed under a box containing the moulding-sand, which drops into and fills the

flask; it is then withdrawn from the sand-box and forced upwards against a pattern of the shape of half of the intended pipe. By the pressure thus given, it is stated, that the sand will be compressed, throughout the whole length and breadth of the flask, as equably as if it had been carefully rammed by the most experienced moulder, and will be sufficiently hard to sustain the pressure of the melted metal.

A, A^1, are upright standards, connected above by a stationary press-beam B, of sufficient length to admit beneath it the longest flask which the machine is intended to press: to this beam the pattern C, is attached. Immediately below the stationary press-beam is a moveable press-beam B^1, equal in length, and corresponding with the upper beam. This press-beam slides vertically, and is guided in slots *a*, in the upright standards A, A^1; and, by raising it, the required pressure is given to the sand in the flask. The raising of this press-beam is effected by two cams b, b^1, (of the same size and form) mounted on horizontal shafts c, c^1, parallel to each other, and attached to the inner sides of the standards A, A^1, at right angles to the plane of the motion of the moveable press-beam: these cams act upon the opposite extremities of the lower edge of the press-beam; and, to produce the pressure, they are turned upwards and inwards towards each other. To obtain this motion, cog-wheels d, d^1, of equal size, are mounted upon the extremities of the respective shafts c, c^1, and are connected by a rack D, which acts on the under side of one wheel d, and on the upper side of the other d^1. A lever-handle *e*, is bolted to one of the cog-wheels; by turning which the cam, attached to its shaft, is raised; thus forcing upwards the extremity of the press-beam on which it acts; while, at the same time, the straight rack D, receiving motion from the cog-wheel d, on the cam-shaft c, transmits it to the corresponding wheel d^1, on the opposite cam-shaft c^1, and, turning it in the direction the reverse of the first, turns upwards the cam b^1, attached to it, and elevates that end of the press-beam. As the cams are exactly alike in size and form, and in the position they occupy upon their respective shafts, and as the two cog-wheels are of equal size and pitch, it is evident that all the positions in which the moveable press-beam may be placed, by the action of the cams, will be parallel to each other.

The flask-carriage E, traverses horizontally across the machine between the two press-beams. This carriage is equal in length to the distance between the upright standards A, A^1, and carries one-half *f*, of the flask (see the sectional figure 3,)

in which the mould is to be made: it is composed of a bed-plate, hollowed to receive the flask, and to give it a firm support. This bed-plate is supported at each extremity, and traverses on ways g, g^1, attached to the upright standards A, A^1, of the press. A reciprocating motion (in the directions indicated by the arrows, fig. 3,) is given to the carriage by the following device:—Two racks h, h^1, are attached to the opposite extremities of the bed-plate E; the teeth of these racks project from their lower faces, and gear into the teeth of two equal pinions i, i^1, mounted upon the opposite extremities of a horizontal shaft F, whose journals are supported in brackets j, j^1, projecting from the standards A, A^1, of the press; a crank G, is fitted to one end of this shaft, by turning which the pinions i, i^1, acting on their respective racks h, h^1, propel the carriage from or towards the operator standing at the front H, of the press. The half-flask is placed upon the bed-plate, and surmounted by a moveable frame or hopper I, which rises sufficiently above the edges of the flask to form a cavity within the two, large enough to receive the exact amount of moulding-sand required to form the mould.

A sand-box J, is attached to the back of the press; this box is equal in length, and parallel in direction, with the press-beams; it contains a sufficient quantity of moulding-sand to form a number of moulds; and its bottom K, slides horizontally from or towards the press-beams, and has its upper surface in the same plane with the upper edges of the hopper I, surmounting the flask on the carriage E. The carriage being brought (in the direction of the dotted arrow, fig. 3,) to the front H, of the machine, the half-flask is placed upon it and surmounted by the hopper I; the hand of the operator is then applied to the crank G, and the carriage is retrograded in the direction of the drawn arrow, fig. 3, and, passing between the two press-beams, strikes the sliding bottom K, of the sand-box; which, giving way before the carriage, allows the latter to take its place beneath the sand. The sand now drops into the cavity of the flask and fills it; the motion of the crank G, being then reversed, the carriage is drawn forward, and, passing beneath the lower edge of the front side of the sand-box, returns filled evenly to the top of the hopper with moulding-sand. On this return motion of the carriage, hooks k, attached to each extremity of its back, engage with corresponding hooks k^1, attached to the sliding bottom of the sand-box, and draw the latter forward,—thereby closing the opening through which the sand dropped into the flask. When the carriage, in performing its forward sliding motion,

has entirely closed the opening of the sand-box, the hooks, attached to the sliding bottom, are disengaged from those of the carriage by a friction-wheel l, attached to them, which, running on a stationary inclined plane m, gradually raises and finally disengages the hook to which it is attached. The carriage being brought exactly beneath the upper press-beam, power is applied to the lever handle e, and the lower press-beam B^1, together with the carriage which it supports, are thereby moved up, with great force, towards the upper press-beam B. The sand is then brought into contact with the pattern C, attached to this beam; and, being prevented from escaping laterally by the hopper I, surmounting the flask, it is compressed until the edges of the flask coincide with the plate to which the pattern is attached, as represented by the dotted lines in fig. 3. The motion of the lever-handle is then reversed, and, the lower press-beam descending, brings down the carriage until its racks h, h^1, are again in gear with their respective pinions i, i^1. The hand of the operator is again applied to the crank-handle G, the carriage is drawn forward, and the flask containing the finished mould is removed: a second flask can then be inserted in place of the first, and the operation repeated.

In the manufacture of pipes, it is frequently advisable that the sand, forming the inner surface of the mould, or that with which the melted metal comes in contact, should be of a quality different from that of the rest of the mould, so as to produce a smooth and finished surface upon the cast pipe. This is generally effected by sifting a thin layer of facing-sand over the pattern, previous to the introduction of the ordinary moulding-sand. In the moulding-machine the same result may be obtained in the following manner:—After the flask has received its proper charge of moulding-sand from the sand-box, it is brought forwards (as before described) beneath the upper press-beam, and raised by the action of the lower press-beam against the pattern. If it be required to face the mould, the flask is not raised to the highest point, but merely high enough to indent the sand contained in it with the pattern; the flask is then lowered and brought forward; and a thin layer of facing-sand is sifted upon it. It is now returned beneath the press-beam; and, power being applied to the lever-handle e, the whole mass of sand is compressed to the required degree. It will be perceived, that by this method the surface of the mould will be coated as equally with facing-sand as if it had been applied in the ordinary hand-moulding. The gate through which the metal enters

the mould is formed at the same time with the rest of the mould, by attaching a pattern of the exact size of the intended gate to the pipe-pattern. The same press might be used to form both halves of the mould, by changing the patterns; but, in practice, it is preferred to use two presses, each with its proper pattern; as the time taken up by the substitution of one pattern for the other is then saved. If deemed advisable, the pattern used may be made a complete instead of a half-cylinder (see fig. 3*,), and imbedded the half of its diameter in a block L, to which it is attached by pivots, on which it can be turned round; an oscillating motion can then be given to the pattern in pressing the sand, which would tend to render the structure of the mould still more uniform.

The mould for the outside of the pipe being thus completed, the next operation is to form the core, which gives shape to its inner surface. To accomplish this, two methods are in general use, depending upon the size of the intended core. Wherever the size of the pipe admits, cores are made of loam, dryed upon a hollow iron core-spindle, through which the gases, generated in "pouring the pipe," pass out of the core. The spindle is firmly supported at each extremity in notches, in which it can be turned by attaching a crank to one of its ends. In cores for large pipes, a straw rope is first wound upon the core-spindle, in order to increase the adhesion of the loam; but, in small cores, the loam is applied directly to a roughened spindle. In order to regulate the size of the pipe, a straight-edge or gauge-board is attached to the supports of the core-spindle, at a distance from its axis equal to the radius of the intended core; prepared loam is applied to the spindle; and, the latter being turned, the surplus loam is struck off by the edge of the gauge-board: after the first coating has been applied, the core is placed in an oven and dried; a second coating is then applied in the same manner; and a second drying follows. In some cases several coatings and dryings are required before the mass is sufficiently smooth and rigid to form a perfect core.

By the second method, the cores are made of carefully-dryed sand in the following manner:—A flat block is prepared, somewhat longer than the intended core, and thicker than half its diameter. In the upper surface of this block a semi-cylindrical trough is formed, its width being the diameter of the core, and its depth being half of its width; and gates or stoppers are placed at each extremity of this trough, at a distance from each other equal to the length of the intended core. The block so prepared is the core-box. Sand is ram-

med into the trough, and pieces of iron are inserted with it, so as to strengthen the core; the surplus sand, projecting above the surface of the core-box, is scraped off; a flat plate (the core-plate) is then applied to the top of the core-box; and the whole being turned upside down, the latter is lifted off, leaving the half-cylinder of sand upon the core-plate. The half-cores, thus formed, are carefully dried; and then the flat sides of two of them are applied to each other and bound together, so as to form a cylinder.

It will be perceived that both of these methods require a large expenditure of labor; and a great delay necessarily occurs in effecting the requisite drying. The object of this portion of the invention is to lessen the labor and do away with the drying. The first object is accomplished by forming a cylindrical core by pressure in the machine represented at figs. 4, 5, 6, and 6*; and the second is attained by a peculiar form of core-spindle, represented at fig. 7.

The arrangement and action of the core-press is as follows:—A cylindrical core-box is formed of sections, which are acted upon by a set of levers, by which they are drawn from, or forced towards, the centre of the core. A measured quantity of sand is introduced into the expanded core-box, together with the core-spindle; and, by applying power to the levers, the sections are forced towards a common centre, compressing the sand from one extremity of the core-box to the other, so as to form a perfectly cylindrical core. Fig. 4, represents the core-press in perspective view; fig. 5, is a plan of the press, turned upside down; fig. 6, is a vertical section, taken at the line *, *, of fig. 5; and fig. 6*, is a section, shewing the manner of attaching the sections of the core-box to the moving parts of the press. The press is composed of a strong bed-frame M, supported, at a convenient distance above the floor on which the operator stands, by end frames N, N^1, which are connected together by braces n, n^1, n^2, n^3. This frame M, supports the sectional core-box, which, in the present instance, is formed by dividing a core-box into four sections by two horizontal planes. The lower section o, is secured to the bed-frame M; the two side ones o^1, o^2, move horizontally outwards, to receive the sand; and the upper one o^3, can be raised above the others, to introduce the sand into the cavity of the core-box. The side sections o^1, o^2, are each attached to a sliding-plate O, O^1, extending their whole length, and moved by a device secured to the under side of the bed-frame M. This device consists of a shaft P, parallel in direction with the axis of the core-box, bent so as to form, at each extremity, two

short cranks p, p^1, whose directions, when the side sections are expanded to admit the core-sand, are at right angles with the direction in which the sliding-plates move, and are opposed to each other. The two cranks p, p^1, (see fig. 5,) projecting above the shaft P, are parallel with each other, and of the same length; and the two p^2, p^3, below the shaft P, are also parallel with each other, and of the same length as the upper ones. The upper pair of cranks is connected with the sliding-plate O, nearer the front Q, of the press by connecting-rods q, q^1, whose length can be accurately adjusted by screws and nuts. The lower pair of cranks p^2, p^3, is connected with the sliding-plate O^1, further from the operator, by connecting-rods q^2, q^3, made and arranged in the same manner as the first pair q, q^1. A lever-handle R, is attached to the shaft, and depends vertically from it when the side sections are expanded (as shewn at fig. 6); when the lower extremity of this lever is raised, the sliding-plates O, O^1, and the side sections o^1, o^2, of the core-box attached to them are forced towards each other; and, when the lever-handle is depressed, the plates and side sections are drawn from each other. A stationary hopper S, to contain the sand, is supported, above the sliding-plates, by elbow-shaped supports r, r, r, which connect it with the bed-frame M;—this hopper is wide enough to receive the upper section o^3, within it. This section o^3, is connected with the bed-frame by two radius bars T, T^1, so that, when lowered, it will always come into its proper place above the lower section o. U, U^1, are two brackets, parallel to each other, and secured to the bed-frame M. A shaft P^1, is suspended by the upper extremities of these uprights above the core-box; and the upper section is connected with the shaft by two pairs of hinged radius bars s, s^1, s^2, s^3,—the combined length of each pair being equal to the distance between the shaft P^1, and the upper section of the core-box, when the latter is depressed to its lowest position. These pairs of radius bars act in the same manner as the braces which distend the hoods of carriages;—they are connected with each other, at their hinged extremities, by a horizontal rod P^3; by forcing which rod backwards, the upper section o^3, is raised; and, by drawing it forwards, the section is depressed upon the sand in the hopper S. The sand is prevented from escaping at the ends of the core-box by end-plates V, V^1. Each end-plate is composed of two sections t, t^1, hinged to each other, and parting at the centre of the core, to admit the core-spindle, which is received in semi-circular notches in the adjacent edges of the sections. The lower section t^1, of each end-plate is formed of a flat bar,

hinged at its back extremity to the bed-frame, and supported at its front extremity (which terminates in a handle) by a spring-catch *u*, *u*¹. A box W, to contain core-sand, is supported, above the sliding-plate near the operator, on standards *v*, *v*, attached to the bed-frame. This box extends the whole length of the press, and contains sufficient sand to form a number of cores. The bottom X, of the box slides directly above the hopper S, either from or towards the operator,—the direction of its motion being parallel with the length of the core-box. It is perforated with an opening *w*, which extends the whole length of the core-box, and contains just enough sand to form the half of a core. The operation is as follows:—The sand-box is filled with sand; the upper section of the core-box is raised by pushing the rod P^3, from the operator; the side sections are drawn from each other by depressing the lever-handle R, which turns the crank-shaft P, below the bed-frame M; the sliding bottom X, is then pushed over the hopper S, and the sand is discharged into the expanded core-box; and the core-spindle is laid upon the sand, and is secured in the end-plates V, V^1. A new portion of sand is now introduced upon the core-spindle, by alternating the sliding-bottom X, of the sand-box; the top section is then depressed, for the purpose of compressing the sand between it and the lower section; and the pairs of hinged radius bars s, s^1, s^2, s^3, locking at their hinges, hold it firmly in its position. Power is now applied to the lever-handle R, below the bed-frame; and the two side sections are forced towards each other,—compressing the sand upon the core-spindle with a force proportioned to the relative length of the handle and the cranks p, p^1, p^2, p^3. The core, being thus fully formed, the side sections are withdrawn from it by depressing the hand-lever; the upper section is raised; and the core is raised from the lower section by the bars t^1, t^1, acting on the ends of the core-spindle, and then removed from the press. Succeeding cores can then be made in the same manner.

The improved core-spindle, which is represented at fig. 7, is constructed in the following manner:—A centre-rod, whose section is a right-angled cross, with arms of equal length, is placed in a lathe, and a screw cut upon its projecting edges; wire is then wound upon it, forming an open helix, through the interstices of which the vapor contained in the core sand can easily escape into the channels between the wings of the rod. The advantage of this construction is, that common moulding sand will adhere to it, and no drying is necessary before placing the core in the mould.

The patentee remarks that the whole operation of moulding by the above-described process can be performed by a person perfectly unskilled in the art, as the amount of compression is not regulated by the skill of the operator, but is governed by the amount of sand introduced by the sliding-bottom; and the core can not only be made in much less time than if rammed by hand, but is more uniform in its structure; and, being equably compressed from end to end, will present an uniform face to the metal surrounding it, and will allow the vapors to escape freely from it.

In filling the moulds with molten metal, the following plan may with advantage be employed, as by it a number of moulds may be simultaneously filled. The apparatus is represented at figs. 8, 9, and 10; the first being a plan of the "sprue case," with a single flask attached to it; the second being a vertical section at the line * * of fig. 8; and the third a horizontal section at the line * * of fig. 9. A number of flasks (eight in the present instance) are arranged vertically in a ring surrounding a central sprue case *y*: this is formed of a flat case *x*, containing channels *y*, *y*, *y*, *y*, *y*, diverging from a common centre, and of a hollow vertical stem *z*, containing a vertical sprue z^1, formed of sand, compressed in the same manner as the moulds.

The melted metal is poured into the upper extremity of the vertical sprue, and passing through the diverging channels, and the gates of the moulds, fills the whole set at once;—thus saving a considerable amount of time, and the labor of filling each mould separately.

By this improved system the several operations of moulding, coring, and casting, follow each other without intermission; and as the labor is greatly reduced, and does not require practised moulders for its successful performance, the cost is not only correspondingly reduced, but the manufacture is freed from the restraints to which it has heretofore been subjected, while the product is uniformly of good quality.

The patentee, in conclusion, states that he does not confine himself to the employment of the precise construction of apparatus above described, as several variations can be made without deviating from the principles of the invention; but he claims, as his improvements in the manufacture of pipes or tubes, Firstly,—the process of forming a pipe-mould, by compressing a measured quantity of sand into each section of the flask. Secondly,—the process of forming a pipe-core by compressing a measured quantity of sand between the converging sides of a sectional core-box. Thirdly,—forming a

core-spindle by enveloping a suitably-shaped metal rod in a coil of wire, upon which the sand is to be compressed.—[*Inrolled April,* 1850.]

To THOMAS WENTWORTH BULLER, *of Sussex-gardens, Hyde-park, in the county of Middlesex, Esq., for improvements in the manufacture of earthenware.*—[Sealed 3rd May, 1849.]

THIS invention relates, firstly, to an improved mode of manufacturing earthenware articles, which are termed by the trade "cock-spurs" and "pins," and are employed for sustaining plates and dishes apart from each other in the "saggers," while they are undergoing the firing operation; secondly, to an improved mode of manufacturing "jelly-cans" or other similar small ware; thirdly, to an improved mode of manufacturing "toy tea-cups" and other similar small ware; and, lastly, to the ornamenting of moulded or pressed earthenware articles requiring the same, by applying thereto, while in a plastic or green state, the impress of an engraved pattern or design.

In manufacturing cock-spurs (the general form of which is a cone, supported at its base by three feet or points), it has heretofore been the practice to stamp them out singly from a piece of prepared clay by means of a suitable die, and to complete their points by manipulation; or to form them singly in a pair of dies, from which they are removed to undergo the firing operation. But these processes are liable to the following objections:—Firstly, as the spurs have to be removed from the die or dies in a green state, a solidity is required to be given them, in order that they shall keep their shape: this is effected by using a large amount of clay, which is objectionable on the score of economy, but principally from the space which the cock-spurs afterwards occupy in the sagger;—secondly, a considerable amount of scrap or waste clay is produced by stamping the spurs singly;—thirdly, the operation is tedious and costly.

Now, according to this invention, large numbers of cock-spurs may be moulded simultaneously in one pair of dies from a sheet of clay, the whole of which will be consumed with little or no waste; and as the spurs are not required to be removed from the bottom die until they have been allowed to dry, they can be made with less clay, and of about two-thirds the height of the best which have heretofore been used: whereby an increased number of layers of plates or dishes

may be got into a given depth of sagger to be fired, which is a matter of great importance to the manufacturer. To effect these improvements the patentee gives the base of the cock-spurs the form of an equilateral triangle, which admits of the arrangement of die shewn at fig. 1, Plate I., being employed. At the centre of the top side of the triangle (as the apex of the spur), and near the angles of the bottom side thereof (as the feet), the requisite points of support are raised; and thereby cock-spurs of the form shewn at figs. 2, and 3, are produced;—the number at each operation being limited only by the size of the dies. In carrying out this part of the invention the patentee casts, in type metal, or other suitable metal, any required number of dies, similar to that shewn at fig. 1, and pierces a fine hole through the several indents (see the cross section, fig. 4,) which form the apex of the cock-spurs; he then drills in a flat brass or other plate, a series of chamfered holes, as shewn at fig. 5, corresponding to the angles in the die, fig. 1, (taking care to pierce right through the plate); and with these two kinds of dies he proceeds to manufacture the cock-spurs. Fig. 6, is an elevation of the kind of fly-press which is employed. Upon the bed A, of the press are two guide-cheeks B, B, which are bevilled at their front ends for the more ready insertion into the press of the bottom die. To the plunger D, the top die E, is secured (a turpentined cloth or flannel being interposed between them); and the ascent and descent of the die is effected by the rotation of a fly-wheel, mounted on the upper end of the compressing-screw F, to the lower end of which the plunger D, is attached. Before commencing the operation of making the spurs, the die C, is brushed over with an oiled brush, to prevent the clay from adhering thereto; a sheet of clay is then laid upon the die; and over this a piece of turpentined cloth or fustian is placed. The die C, being now put into the press, the top die is brought down (by turning the fly-wheel), and made to press the clay into the recesses in the lower die; it is next raised to remove the turpentined cloth from the clay; and then the top die is again brought down (at this time into contact with the clay) to form the feet of the cock-spur. Suitable pressure having been applied for this purpose, the top die is again raised; and the lower die, containing the manufactured cock-spurs, is withdrawn, and carried to the drying-room. The same operation is then repeated with another die C; and thus successive sheets of clay are quickly converted into spurs. By a precisely similar method the patentee produces the pins which are made to protrude from the sides of the saggers to support,

in the saggers, plates of a superior quality; in manufacturing which, it is an object that their upper surface shall receive no defective marks from the points of support whilst being fired. At figs. 7, 8, and 9, the construction of die, in which these pins are moulded, is shewn;—fig. 7, being a plan view; fig. 8, a cross section; and fig. 9, a longitudinal section of the same. The pin itself (one of which is shewn in plan and end view at figs. 9*,) consists of a length of clay, having a triangular section, on one edge of which, near the end, a point of support is raised. In order to use sheets of clay, without making scraps or waste pieces, the cells or recesses in the die, for moulding these pins, are arranged in parallel lines. The die itself is formed of type or other suitable metal, as in the case of the cock-spurs. Instead of the top die, a smooth plate merely is required to give the pressure to the clay. As the mode of working is precisely similar to that before mentioned, with respect to the cock-spurs, no further description will be necessary.

The second head of the invention (which relates, as before stated, to the manufacture of jelly-cans, jars, and other similar articles) consists in forming them in suitable moulds by pressure, instead of "throwing" them upon the "wheel" and turning them down in the lathe, as is now the practice. At figs. 10, 11, and 12, the improved moulding apparatus is shewn;—fig. 10, being a vertical section of the several parts fitted together; fig. 11, a plan view of the lower mould or core for forming the hollow of the can or jar; and fig. 12, an outside view of the upper mould. A, fig. 11, is the core or lower mould, over which the tubular mould B, for forming the outer periphery of the can or jar, fits. The upper end of this mould constitutes a guide for the reception of the plunger C, which is suitably shaped, on its under surface, to form the bottom of the can. In operating with this apparatus, the mould B, is placed over the core A, as shewn at fig. 10, and a bat of clay, of an ascertained amount, is thrown therein; the plunger C, is then driven down with great force by a mallet, or other suitable means; whereby the clay is made to fill the space between the moulds A, and B, and take the form of the required can or jar. The moulded article is now to be released; and for this purpose the plunger C, is first drawn up,—a slight axial motion being given to it at starting, to free it from the clay. The can or jar, with the mould B, is next removed from the lower mould,—a similar motion being communicated to this latter, for the purpose of freeing it from the clay. To effect this with uniformity, the lower

edge of the mould B, is provided with inclined planes, as shewn at fig. 12; the highest points of which rest upon fixed radial stop-pins D, in the lower mould (see fig. 11,) when the moulds are properly put together. The workman, in taking off the mould B, turns first the lower mould A, and so causes the stops to slide over the inclines; whereby a vertical movement is given to the mould B, simultaneously with the axial motion of the mould A;—the mould B, being then lifted up, brings with it the moulded article. The can or jar is next removed from this mould B, by inserting therein the plunger C; and it is then put aside to dry.

The third part of the invention, which refers, as before stated, to the manufacture of toy tea-cups, consists in moulding them in suitable dies, instead of forming them by employing the jigger and lathe, as heretofore. Fig. 13, shews the dies in vertical section in the position they would be when a cup had just been formed. A, is the bottom die; B, is the top die; and C, is the guide, consisting of four horns, the inner sides of which are ground concentric, to receive the top die or plunger B. An opening is made in the bottom die, to receive the spindle D, which is connected to a treadle under the bench on which the die is placed, and carries, at its upper end, a disc E, suitably shaped to form the recess in the bottom of the cup. A given amount of clay is thrown into the die A; and the die B, is then brought down upon it with sufficient force to cause the clay to fill up the space between the two dies, and thereby to form the cup. The top die is then raised, and pressure is put upon the treadle before mentioned; and thereby the disc E, is caused to rise and discharge the cup from the lower mould.

The last part of the invention, viz., the ornamenting of moulded earthenware articles in a green state, is explained with reference to the toy tea-cup just described; but it will be obvious that other articles, formed in a similar manner, may likewise be similarly ornamented, if required.

To paint or impress an engraved design upon toy tea-cups, a brass die is constructed, the diameter and shape of which is a counterpart of the lower die in which the cup has been formed; and upon the inner face thereof any desired pattern is engraved, as shewn at fig. 14. Into this pattern the workman rubs printing ink, of any required color, and cleans off the surface, as in copper-plate printing. The mould is then ready for use. A cup, which has just been discharged from the die, fig. 13, is now placed in the die, fig. 14; and then a plunger being brought down upon it forces the clay into close

contact with the die, and causes it to take up the ink in the engraved lines;—thus the counterpart of the engraving will be produced upon the cup. The discharge of the cup from the die is effected by a treadle, as before explained. When a pattern is also required on the inside of the cup, the plunger or inner die is engraved and properly inked; and the pressure of the inner die on the cup will then produce the pattern upon both sides thereof simultaneously.

The patentee claims, as his improvements in the manufacture of earthenware, First,—the employment of cock-spur dies, the cells or recesses of which are formed and arranged as shewn at figs. 1, and 5; whereby he is enabled to manufacture large numbers of cock-spurs at one operation from a sheet of clay, with little or no scrap-waste, and of a superior quality to those now in use, as regards the reduction made in their height. Secondly,—the employment of pin-dies, the cells or recesses of which are formed and arranged as shewn at figs. 7, 8, and 9; whereby large numbers of pins may be made from a sheet of clay at one operation, with little or no scrap-waste. Thirdly,—the mode of manipulation above described; whereby the perfect moulding of the spurs and pins is effected, and the proper discharge of the same from the dies is insured. Fourthly,—the mode of manufacturing jelly-cans, and other similar small ware, as above described. Fifthly,—the mode of manufacturing toy tea-cups, and other similar small ware, as above described. And, lastly,—the applying to earthenware articles, when in a green state, a printed pattern, by bringing them into close contact with engraved surfaces containing ink or color in or upon their engraved parts.—[*Inrolled November,* 1849.]

To FREDERICK HALE THOMSON, *of Berners-street, Oxford-street, and* EDWARD VARNISH, *of Kensington, in the county of Middlesex, for improvements in the manufacture of ink-stands, mustard-pots, and other vessels of glass.*—[Sealed 19th December, 1849.]

THIS invention consists in blowing or forming glass vessels with hollows or spaces between the sides thereof, and silvering the inner surface of such hollows or spaces, so that the effect of silvering will be seen both internally and externally of the vessel. Glass vessels may be thus made and ornamented for a great variety of purposes, such as flower-vases, ink-stands, ink-glasses and covers, brush-trays, pen-trays, muffineers,

smelling-bottles for silver tops and glass stoppers, "toilets," caddy-basons and sugar-basons, butter-dishes, covers, and plates, dishes, goblets, mustards and covers, salt-cellars, mugs with hollow handles, plateaus, wine-coolers, finger-cups, bottle-stands, cruets, linings for silvers [*qy.* salvers], &c.

In Plate II., fig. 1, is a vertical section of a glass vessel of a vase form, the upper part of which is blown or formed with double sides, the stem and foot are hollow, and there is a hole *a*, at the bottom, through which the solution of silver, employed for silvering the vessel, is to be poured. The solution which the patentees prefer is made by mixing together one ounce of hartshorn or ammonia, two ounces of nitrate of silver, three ounces of spirit (preference being given to spirit of wine), and three ounces of water,—permitting the mixture to stand for three or four hours, and then filtering. To one ounce of the filtered fluid, the patentees add about one quarter or less of saccharine matter, dissolved in equal parts of spirit and water (say about half a pint of each): they state that they prefer grape-sugar so dissolved, if the solution is allowed to stand for a few hours. The invention is stated to be applicable to the manufacture of looking-glasses, and many other descriptions of glass articles, either hollow or with a flat surface, which it is desirable to coat with silver. Either horizontal or vertical surfaces may be silvered according to this invention, provided the silvering liquid be kept in contact with the surface of the glass, which should be heated to 160° Fahr., and kept at that temperature during the process. As soon as the silver upon the glass is dry, it may be varnished with common mastic varnish, to preserve it from injury by friction. The patentees do not make any claim to this mode of silvering glass, as it is well known; nor do they confine themselves thereto, as other solutions or fluids may be used for the purpose.

Fig. 2, is a vertical section of an ink-stand, and fig. 3, is a vertical section of a finger-glass, both of which are formed, according to this invention, with a space *b*, between the sides, into which the silvering liquid is introduced through the hole *a*. In some cases, the internal and external parts of the vessel may be made separate, as represented at fig. 4, which is a glass vase, composed of two parts *c*, *d*, united together at the rim by a metal edge-piece *e*, or other suitable means.

Vessels made according to this invention may be ornamented by cutting in the ordinary manner. The silvered surfaces will not come in contact with the liquids which may be introduced into the vessels, nor will they be liable to be

touched when the vessel is being cleaned; for, after the process of silvering has been performed, the remaining liquid is to be poured out of the space *b*, and the opening *a*, closed, to protect the silver.—[*Inrolled June*, 1850.]

To Alfred Dalton, *of West Bromwich, in the county of Stafford, ironfounder, for improvements in reverberatory and other furnaces.*—[Sealed 15th December, 1849.]

This invention consists in certain improvements in furnaces in which atmospheric air is admitted at the sides of the fire-places thereof, above the fire-bars.

Furnaces have before been made with numerous openings at the sides, for the purpose of admitting air above the fire-bars; and the material usually employed for making the sides has been fire-brick or stone; and the openings have been obtained, either by setting the bricks apart from each other, or by making the sides of lumps of fire-clay or of stone, with perforations through the same. But, in consequence of the great heat generated in some furnaces, parts of the materials of which the roof and sides are composed, melt and run down the sides; and these melted matters, together with the clinkers formed by the fuel, stop up the air-holes. Now this invention has for its object, amongst other improvements, to obviate this prejudicial effect, by setting back the sides or recesses forming therein, so that the melted matters from the roof and upper part of the sides, in place of running down the lower part of the sides and into the air-openings, will drop down without coming in contact with those parts of the sides: therefore the holes are not so liable to become stopped up; and this is the case, whether the sides are made of fire-bricks, fire-lumps or tiles, or fire-stone, or of iron,—which latter substance may be in the form of perforated plates or consist of bars (fixed at small distances apart) or other forms.

Another part of the invention is applicable to puddling, reheating, and similar furnaces, used for heating and melting iron, and consists in forming the sides of iron, with suitable means for introducing streams of air into the furnace, above the fire-bars: this may be done by making the sides of perforated iron plates, or by using other forms of iron, such as bars, with spaces between them to admit streams of air to the fuel upon the fire-bars.

In Plate I., fig. 1, is a longitudinal vertical section of a puddling furnace constructed according to this invention;

fig. 2, is a horizontal section thereof, taken on the line A, B, of fig. 1; fig. 3, is a transverse section, taken on the line C, D, of fig. 2; and fig. 4, is another transverse section, taken on the line E, F, of fig. 2. The sides *a, a,* of the fire-place, are made of iron, with perforations *b, b,* therein for the passage of air; and the sides are recessed or set back, as shewn at *a**, *a**, fig. 4, to prevent the air-holes from being filled with the melted matters which drop from the roof and upper part of the sides of the furnace. The arrangement of flues represented at figs. 1, 2, 3, and 4, (for supplying air to the iron sides of the fire-place) also constitutes a part of this invention.

The patentee claims, Firstly,—the mode of constructing the fire-places of furnaces, when streams of air are admitted at the sides or any of them, by recessing or setting back the parts of the sides through which the streams of air pass. Secondly,—the forming of the parts of the sides of the fire-places of puddling and similar furnaces, used for heating and melting iron, of perforated plates of iron and of iron in the form of bars. Thirdly,—the combining the arrangement of flues shewn with the use of iron sides of such fire-places, whether perforated or in the form of bars.—[*Inrolled June*, 1850.]

To AMBROISE ADOR, *of Paris, in the Republic of France, engineer, for improvements in producing light.*—[Sealed 24th November, 1849.]

THE object of this invention is to obtain a better light than is commonly produced by the combustion of gas; and it consists in combining apparatus for vaporizing hydro-carbon with and intermediate of a gas-burner and the tube that supplies it with gas.

In Plate II., a vertical section of the apparatus, combined with a gas-burner, is shewn. *a,* is a common argand gas-burner; *b,* is a thimble or deflector of platina; *c,* is a vessel, which may be of a spherical or other suitable shape, and is connected by tubes *d, d,* with the burner; *e,* is a tube which connects the vessel *c,* with the spherical vessel *f,* containing hydro-carbon, and serves to transmit heat from the vessel *c,* to the hydro-carbon in the vessel *f,* for the purpose of converting it into vapour; and *g,* is a pipe leading from a gas-main, by which gas is supplied to the vessel *f,* and through the tube *e,* vessel *c,* and tubes *d, d,* to the burner *a,*—the gas, in its passage, mixing with the vapour or product from

the liquid in the vessel *f.* On the gas-burner *a,* being lighted, the vessel *c,* will soon become heated; and such vessel being made of metal, the heat will be quickly transmitted therefrom through the tube *e,* to the vessel *f.* A portion of the hydro-carbon contained in the vessel *f,* will by this means be vaporized; and the gas and vapour will pass together into the vessel *c,* where they will become highly heated; and in such heated state they will pass from the vessel *c,* through the tubes *d, d,* to the burner.

The patentee says, he is aware that gas apparatus has before been so arranged that the gas has been heated in its passage to the burner by the flame arising from such burner; he is also aware that hydro-carbons have been vaporized in a vessel heated by a flame resulting from the combustion of a vapour of hydro-carbon supplied from such heated vessel to the burner; and he does not, therefore, lay claim to either of such arrangements of apparatus separately. He claims, as his invention, the combining apparatus for vaporizing hydrocarbon with and intermediate of a gas-burner and the tube which supplies it with gas.—[*Inrolled May,* 1850.]

To JOHN FAYRER, *of Surrey-street, Strand, Commander in Her Majesty's Royal Navy, for improvements in steering apparatus*—[Sealed 11th January, 1850.]

THIS invention consists in so arranging apparatus in combination with the steering-wheel of a ship that the steersman may, by his foot, bring a break into action, so as to retain or aid in retaining the rudder in any position into which it may be brought by turning the steering-wheel.

In Plate III., a front view of a steering-wheel is shewn, with the retaining apparatus applied thereto,—parts of the wheel being broken away, to shew the retaining apparatus more clearly. Upon the axle of the steering-wheel *a,* is fixed a wheel or pulley *b,* on which the break *c,* is intended to act. The break *c,* consists of a metal band, that nearly encircles the wheel *b,* and is lined with blocks of wood, which bear upon the periphery of the wheel *b,* when the break is in action. The metal band is fastened at one end to the upright arm d^1, of the lever *d;* and the other end of the band is connected by an adjustable joint *e,* with the lever *d,* below its fulcrum: therefore, when the outer end of the lever is pressed downwards, by the foot of the steersman, into the position shewn, the band will be caused to contract, and the

blocks of wood will be brought forcibly into contact with the periphery of the wheel *b*, and thereby prevent the rudder from moving. The horizontal arm d^2, of the lever *d*, is connected by a link with another lever *f*; so that if there be two steersmen at the wheel, either or both can bring the break into action, by pressing down the outer end of the lever *d*, or *f*, or both, with the foot. On the pressure being removed, the counter-balance weight *g*, depresses the short ends of the levers *d*, *f*, and causes the metal band to expand and release the wheel *b*, from the pressure of the wooden blocks, and so leave the rudder free to be moved by the steering-wheel. It will thus be evident, that the counter-balance weight *g*, will keep the break out of action and the outer ends of the levers *d*, *f*, raised, except when it may be desirable to retain the rudder in one position, which can be instantaneously effected by depressing the outer end of the lever *d*, or *f*, or both, as before described.

The patentee says he is aware that it has been before proposed to apply a break in combination with a steering-wheel,—such break being brought into action by a weight, and put out of action by the foot of the steersman. He does not, therefore, claim the application of a break to a steering-wheel, generally; but what he claims is, the so arranging of apparatus in combination with a steering-wheel that the steersman may, by his foot, bring a break into action, so as to retain or aid in retaining the rudder in any position in which it may be brought by the steering-wheel.—[*Inrolled July*, 1850.]

To Frank Clarke Hills, *of Deptford, in the county of Kent, manufacturing chemist, for an improved mode of compressing peat, for making fuel or gas; and of manufacturing gas; and of obtaining certain substances applicable to purifying the same.*—[Sealed 28th November, 1849.]

The improved mode of compressing peat, which constitutes the first part of this invention, consists in subjecting it to pressure between inclined planes or rollers,—porous or absorbent filtering materials, such as sand or gravel, being employed for the purpose of separating the water from the peat, and retaining the solid particles of the peat.

In Plate III., figs. 1, 2, and 3, represent one arrangement of apparatus employed for this purpose. Fig. 1, is a longitudinal section of the apparatus; fig. 2, a plan (partly in section, and with one of the covers removed); and fig. 3, a

section upon the line A, A, of fig. 1. Figs. 4, and 5, represent variations in the details. *a, a,* are two troughs, placed in a straight line, and at the same level. The bottoms *b,* are formed as gratings; and the ends *c, c,* do not reach to the top,—a space of about three inches being left between them and the under side of the covers *d, d,* which are bolted to the upper part of the troughs. Upon the gratings *b, b,* is placed a layer of coarse gravel, clinkers, or other similar material, which will not pass through the gratings; then a succession of layers of gravel, each finer than the last; and, lastly, a layer of sharp sand, upon which is laid a sheet of perforated metal *e, e,*—thus forming two long shallow rectangular chambers, open at each end. To prevent the perforated plate from being strained by the subsidence of the sand, a number of bars *f, f,* are placed in the troughs, and rest upon ledges on the end-pieces and the cross bar *g*: the upper surfaces of the bars are level with the top of the end-pieces, and the sand is filled in between them to the same level. *h, h,* are hoppers, placed over an aperture *i, i,* in each cover, for the admission of the peat; and *k, k,* are two plungers, accurately fitting the chambers. These plungers are connected together by a slotted frame *m,* in which works a crank *n,* (driven by any suitable prime mover), which imparts a to-and-fro motion to the plungers. At each successive stroke of the plungers, a portion of peat is admitted through the hopper into one chamber, and a similar portion is forced forward along the other chamber. The pressure is regulated by means of two moveable inclined planes, as at *o, o,* or by rollers *p, p,* which may be brought nearer together, or set further asunder, so as to vary the size of the discharge aperture, and, with it, the pressure to which the peat is subjected. At each stroke of the plungers, as just stated, a portion of peat is admitted into one of the chambers, and the peat in the other chamber is forced along the chamber towards the orifice; but, from the resistance opposed to its passage, the water will be squeezed out, and will percolate through the sand; and the peat will be forced out at the discharge aperture in a compressed state. The four sides of the chambers should be made as smooth as possible; and, in lieu of covering the surface of the sand with a plate of perforated metal, it may be covered over by a range of straight bars, made smooth on their top and sides, and placed longitudinally in the chambers—side by side, with very thin washers (say about one-sixteenth of an inch thick) interposed between them at each end, so as to form very narrow longitudinal slits, as shewn in the section fig. 5. The cover, like-

wise, instead of being bolted to the sides of the chamber, may be hinged to it near the hopper; and a loaded lever may be applied to the opposite end, as shewn at fig. 4, to regulate the pressure (in this case, the rollers or inclined planes shewn at fig. 1, will not be requisite); and, instead of the cover being made solid, it may be composed of two gratings, with very narrow longitudinal spaces between the bars, and having a layer of cocoa-nut fibre or fabric interposed between them, as shewn at *q, q,* in figs. 4, and 5.

The second part of the invention relates to the production and purification of gas, and to the obtaining of certain products suitable for purifying the same.

The improvement in the production of gas consists in a method of drying and warming the coals (before they are put into the retorts to be distilled) by the waste heat from the ordinary retort-beds: the coals will then be more quickly carbonized than when used cold or damp; and less fuel will be required to distil off the gas. This is effected in the following manner:—The patentee takes two or more retorts of any length or size required, but which he prefers to be of the ordinary length of gas-retorts, about twelve or fourteen inches in diameter, and of a cylindrical form; and he places them one above another between the ordinary beds of carbonizing retorts, either at the sides of the arches, or in the piers which support the arches. The waste heat from the retort-beds is to be conducted round and between these warming retorts by means of flues, so as to keep them at a regular heat. Wrought-iron scoops, to fit loosely into the warming retorts, must be provided: such scoops as are generally used for charging ordinary retorts (only a little deeper, so as to hold as much coal as possible) will answer the purpose. These scoops are to be filled with coals in the ordinary way; and they are then to be put into the warming retorts, and allowed to remain there until the coals become sufficiently dry and heated—taking care not to decompose or cake the coals. The scoops are then to be drawn out of the warming retorts with their charge of coals, which is to be introduced into the ordinary decomposing retorts. The warming retorts are placed between the ordinary beds of retorts, to obtain a convenient height for charging and discharging them. Two of these warming retorts will generally be found sufficient for a bed of seven carbonizing retorts.

The improvements in the purification of gas, and in obtaining certain products, consist, in the first place, of a method of purifying it from sulphuretted hydrogen, cyanogen, and

ammonia, by passing it through the porous material or materials hereafter mentioned; and of renovating the material employed, after it has become inert; and of obtaining the sulphur, cyanogen, and ammonia (either alone or in combination) which were contained in the gas. The patentee effects this in the following manner:—He takes the subsulphates, the oxychlorides, or the hydrated or precipitated oxides of iron (which he prefers to use in a rather damp state), either by themselves or mixed with sulphate of lime or sulphate or muriate of magnesia, baryta, strontia, potash, or soda; and he causes them to be absorbed into or mixed with sawdust, or peat charcoal, in coarse powder, or breeze, or other porous or absorbent material, so as to make a very porous substance, easily permeable by the gas. This material is to be put into a purifier (a dry lime purifier will answer the purpose), and the gas is to be passed through it; and thereby the gas will be deprived of its sulphuretted hydrogen, cyanogen, and a part of its ammonia, which will be absorbed into the porous material,—water being at the same time formed by the union of the oxygen of the oxide and the hydrogen of the sulphuretted hydrogen absorbed. As soon as the material ceases to purify the gas from sulphuretted hydrogen, the gas is to be shut off from the purifier; and then a communication is to be opened with the external air, which is to be admitted to the purifying material, and by the agency of which it will be renovated, and the uncombined gases, which have been absorbed, will be driven off. The best way to effect this is partially to take off the atmospheric pressure at the top or bottom of the purifier, in which the purifying material is contained, by connecting it, by means of a pipe, with a hot and powerful chimney, or with an exhausting apparatus, so as to cause a current of air from the opening in the purifier, which communicates with the external air, to pass through the purifying material. The current of air will carry off the volatile gases which have been absorbed into the purifying material from the gas, but which have not united with the purifying material,—consisting principally of ammonia and of some sulphuretted and carburetted hydrogen. The air will, at the same time, re-oxidize the iron of the sulphuret of iron which has been formed, and sulphur will be precipitated, and a small but variable quantity of sulphuric acid will be formed. Instead of admitting the air to the purifying material, in the manner described, it may be admitted in any other convenient way; and sufficient heat may be generated, during the pro-

cess of renovation, to drive off the volatile gases that have been absorbed. The ammonia driven off from the purifying material, whether free or in combination, is to be collected by passing it through a condenser, which may be formed of the pipes leading from the purifier to the exhausting apparatus; or the ammonia may be fixed by an acid, or retained by any other effective means. If sulphate of lime or sulphate or muriate of magnesia be present in the purifying material, they will be decomposed,—their acids uniting with the ammonia. As soon as the iron is re-oxidized, which will generally be the case in a few hours, the gas is to be passed through it again, when the same effect will take place as at first; and this process of purification and reoxidation or renovation of the purifying material is to be repeated until the purifying material ceases to be efficacious. It is then to be taken out of the purifier; and the sulphur and cyanogen, and also the ammonia or ammoniacal compounds, may be extracted from it. The patentee states, that he prefers to effect the renovation of the purifying material without withdrawing it from the purifier, by exposing it to the influence of the atmosphere, which may be either admitted to it or be drawn or forced through it by any suitable means, whereby the iron will become re-oxidized and fit for again purifying the gas.

Before submitting the gas to the action of the purifying materials before mentioned, he prefers, first, to remove the greater part of the ammonia by means of a water-scrubber, or by any other plan that may be preferred, and then to pass the gas through the porous purifying material before mentioned, to remove the sulphuretted hydrogen and cyanogen. The purifying material will then last longer; as the ammonia takes away, in combination with it, a good deal of the sulphur which would otherwise combine with the iron. The hydrated or precipitated oxides of manganese and zinc may be used in the same manner as described for the oxides of iron, though not with equal advantage. Hydrated or precipitated oxides of iron may be conveniently prepared for these purposes by decomposing sulphate or muriate of iron with hydrosulphuret of ammonia, or with lime, magnesia, potash, or soda; and they may then be absorbed into or mixed with sawdust, peat charcoal, or breeze, or other such material, and afterwards exposed to the air.

The improvements in the purification of gas consist, further, of the following methods of supplying water, or ammo-

niacal liquor, or other purifying liquids, to gas-scrubbers or purifiers, and distributing them equally over the surface of the media with which the purifier is charged:—

First method.—At an elevation of a few feet above the purifier is placed a vessel, such as *a*, fig. 6, capable of holding a few gallons; and into this the purifying liquid is to be run, by a regulating cock, in any required quantity. In one side of this vessel, near the bottom, is a long narrow longitudinal aperture, say three inches long by one inch deep, and fitted on the interior surface with a sliding valve *c*, which is kept to its seating by slight springs *d, d*. This valve is connected by a slot-joint to the rod *e*, which is connected to the arm *f*, of the tumbling lever f, f^1,—the arm f^1, of which has a knob or ball *g*, at the top. The connecting-rod *e*, carries a tappet *h*, near each end; between which tappets, and sliding freely on the rod, is placed a float *i*, which rises and falls as the liquid runs in or out of the vessel. The float, in its ascent, acting upon the upper tappet, gradually elevates the arms of the tumbling lever until the arm f^1, has passed the vertical line, when the weight *g*, will cause the arm to descend suddenly into the position shewn in the figure; and the sudden rise of the arm *f*, will pull the valve up at once with a jerk,—letting out the purifying liquid; it will also shut it again with a jerk, when, by the sinking of the float, its weight will pull the tumbling lever over again to the same side that it was at first. The purifying liquid is to run from this vessel into a series of pipes, equally divided over the surface of the media in the purifier, and about 18 inches apart; and these pipes are to have small holes drilled in them on opposite sides, at regular intervals apart, so that when the liquid is let into them it will spread in little jets all over the surface.

Second method.—The purifying liquid may be supplied to the scrubbers or purifying vessels by forcing it, at intervals, into the spreading pipes, before mentioned, by a pump or other machine. Instead of spreading-pipes, as described, a pipe or pipes may be placed in the centre or other parts of the purifier, with a rose or spreader like a garden-engine or syringe, with little holes, or a slit, or such like contrivance, all round the circumference; and the liquid being forced into this, or let in from a height above, will spread pretty evenly over the surface of the media contained in the purifier.

The improvements in obtaining certain substances applicable to purifying gas consist of a method of making the precipitated oxides and subsulphates of iron. To prepare the hydrated or precipitated oxides and subsulphates of iron, the

patentee takes the precipitated sulphurets of iron, obtained in any convenient way, and mixes them with, or causes them to be absorbed into, sawdust, breeze, or other porous material; and then he exposes the material so made to the air, to absorb oxygen, whereby the oxide and subsulphate of iron are obtained.

The claims made by the patentee are, Firstly,—compressing peat over or between porous or absorbent media, as sand, or gravel, or cocoa-nut, or other suitable vegetable fibre or fabric, in the manner hereinbefore described. Secondly,—drying and warming the coals (before the gas is distilled off from them) in retorts or ovens, made of any suitable material, and heated by the waste heat from the ordinary retort-beds. Thirdly,—purifying coal-gas from sulphuretted hydrogen, cyanogen, and more or less perfectly from ammonia, by passing it through the precipitated or hydrated oxides of iron, or the subsulphates or oxychlorides of iron, from whatever source obtained, either by themselves, or, which is much better, made into a more porous material, by being absorbed into or mixed with sawdust, or breeze, or peat-charcoal, in coarse powder, or other porous or absorbent material, so as to be readily permeable by the gas, and either used alone or mixed with sulphate of lime, or sulphate or muriate of magnesia, potash, or soda, or in conjunction with any other purifying material at present in use for a similar purpose; but he does not claim peroxides of iron or manganese made at a red heat, or the oxide of iron mixed with chloride of calcium, or with the muriates and sulphates of manganese, iron, and zinc, and absorbed into sawdust, &c. Fourthly,—repeatedly renovating or re-oxidizing the said purifying materials by the action of the air, whenever they, from time to time, cease to absorb sulphuretted hydrogen, so that they may be used over and over again, to purify the gas. Fifthly,—the collection of the ammonia or ammoniacal compounds given off from any purifying materials containing the said oxides, subsulphates, and oxychlorides, while being aired or renovated, either by the use of a condenser of any suitable description, or by combining the said ammonia or ammoniacal compounds with acids or water. Sixthly,—the collection of the sulphur, cyanogen, and ammoniacal compounds, formed in the purifying materials during the process of purification and renovation. Seventhly,—employing the precipitated or hydrated oxides of manganese and zinc in the same manner as described for the oxides of iron. Eighthly,—supplying the purifying liquid to the scrubbers or purifiers, at intervals, by means either of a

supply-cistern, situated above the purifiers, and having a valve or cock working with an intermitting action, or by means of a forcing-pump or syringe, likewise acting at intervals;—such elevated cistern, or such forcing-pump, being connected with perforated pipes, roses, or jets, placed within the purifier, in such manner that the liquid will spread evenly over the surface of the media contained in the purifier. Lastly,—making the oxides and subsulphates of iron from precipitated sulphurets of iron, by mixing such sulphurets with or absorbing them into sawdust, or breeze, or other porous material, and then exposing the materials to the air to absorb oxygen.—[*Inrolled May,* 1850.]

To MACGREGOR LAIRD, *of Birkenhead, Gent., for improvements in the construction of metallic ships or vessels, and in materials for coating the bottoms of iron ships or vessels, and in steering ships or vessels.**—[Sealed 19th January, 1850.]

THE first part of this invention relates to the use of corrugated metal in the construction of ships or vessels, and to the employment of hollow sheet-metal framing for ships or vessels.

The patentee states, that it has been proposed to employ corrugated metal, in two ways, in the manufacture of ships or other vessels: in one case, the corrugated metal, constituting the hull of the ship, was sheathed or covered with flat or plain sheets of metal; and in the other case the sheet metal was bent between concave and convex moulds, in such manner that the operation of bending should take up or corrugate those parts which were not necessary for the contour of the ship or vessel;—such corrugations, therefore, would not be regular at all parts. Now, the patentee proposes to employ corrugated metal for the external surface of ships or vessels, with the corrugations running longitudinally at the sides thereof from stem to stern. The frames, when any are used, may be made of angle-iron or other bars, as heretofore; and the plates of corrugated iron may be caused to form butt or lap-joints, as when plain or flat sheets of metal are used;—the corrugations in the several plates or sheets, where they come together, being similar in form and distance apart.

* By a disclaimer, dated July 19, 1850, the patentee has struck out the words "and in materials for coating the bottoms of iron ships or vessels, and in steering ships or vessels" from the title of his patent, which now stands for "improvements in the construction of metallic ships or vessels."

Sheets or plates, with like parallel corrugations, may be used from stem to stern, by cutting off the edges of the sheets as they approach the stem or stern; or, in place thereof, the plates or sheets may be hammered on or in moulds, or rolled in such manner as to produce corrugations decreasing regularly from the widest corrugation to nothing at the bow or stern of the ship. The object of this part of the invention is to obtain lightness with great stiffness, and that more cheaply and readily than when employing corrugated plates, every part of the corrugations of which is caused to differ from all the other parts, by using different concave and convex moulds for every form of boat or vessel, and for every form of corrugation required.

Another improvement, included in the first part of the invention, consists in employing hollow sheet-metal framing for ships and other vessels, in order to obtain stiffness with lightness. For this purpose, supposing it be desired to strengthen a ship or vessel (constructed of ordinary sheet metal) in a direction fore and aft of the same, the patentee employs sheet-metal frames, either externally or internally, each bent into a hollow or trough-like form, with flanges on either side; and he fixes such trough-like framings at suitable intervals apart, by rivetting them to the sheet-metal sides of the ship or vessel, so that they will appear, when outside of the ship, like so many projecting convex streaks running fore and aft of the same; or, if preferred, they may be fixed on the interior of the sheet-metal sides; or such hollow frames may be employed inside in place of angle-iron or other bars, and constitute the main framing of the ship or vessel, and have the sheets of metal rivetted thereto. It is stated, that not only will great stiffness and stability with lightness be obtained by the use of the hollow sheet-metal frames; but that, as the space between the sheet-metal sides and the hollow frames will be enclosed, they will therefore aid in buoying up the ship or vessel. The patentee states that, in general, it will be most advantageous to employ sheet-iron coated with zinc in metal ship-building.

The second part of this invention relates to the building of metal vessels or boats in sections, which may be readily joined together.

Many iron vessels have been constructed in this country and sent out in parts to India and other places; but such parts have had to be fixed together by rivetting the ends of the plates of which the parts were composed; and hence it has been requisite to send out skilled workmen to put the

parts together. Now the patentee proposes to build vessels or boats in sections, with internal flanges, in such manner that they may be fixed together by screw-bolts and nuts or similar means by a common labourer. This part of the invention also consists in building vessels or boats in sections or parts, each having two bulkheads or ends, and in such manner that a greater or less number of such sections may be used to form a boat, according to the service for which the boat is required. When the sections are being united, vulcanized India-rubber or other suitable material is used to make the joints water-tight when drawn together by screw-bolts and nuts. In Plate III., fig. 1, is a plan view, fig. 2, a longitudinal section, and fig. 3, a transverse section of a boat, formed of eight sections, united by screw-bolts and nuts. Figs. 4 and 5, exhibit a steam-boat or other vessel made of eleven sections, each having a bulkhead at either end. Fig. 6, is a boat composed of two sections; fig. 7, shews two extra sections, to be used for increasing the size of the boat; and fig. 8, represents the boat as it would appear when the four sections were united together.

The third part of this invention consists in rendering the decks of ships or vessels, made wholly or partly of iron, perfectly flush, by means of asphalte. The patentee prefers to make the decks of corrugated iron, and then to fill the corrugations and render the deck flush with asphalte.

The last part of the invention consists in constructing vessels with longitudinal and transverse bulkheads, to facilitate the carrying of cargo in bulk. Fig. 9, is a plan view, and fig. 10, a transverse section of a "tank" ship, designed for carrying oil, grain, or other matter, in bulk. It is divided by longitudinal and transverse bulkheads into twelve compartments, which may communicate with each other by manholes or other convenient means. The bulkheads prevent the cargo from shifting, and give greater stiffness to the vessel.

The patentee claims, Firstly,—the improved means of constructing ships or vessels, by employing corrugated metal, as above described; and also the employment of hollow sheet metal framing, as explained. Secondly,—the building of metal vessels or boats in sections, with internal flanges, and also so as with facility to arrange more or less sections into larger or smaller boats or vessels. Thirdly,—the coating decks of vessels, made or partly made of metal, with asphalte. Fourthly,—the improvements, above described, in respect to ships or vessels with longitudinal and transverse bulkheads, to facilitate the carrying of cargo in bulk.—[*Inrolled July*, 1850.]

To BARON JAMES ULRIC VAUCHER DE STRUBING, *of Margaret-street, Cavendish-square, in the county of Middlesex, for improvements in the manufacture of axletree-boxes for carriages, and of the bearings of the axles of railways, and in the making of an alloy of metal suitable for such and the like purposes.*—[Sealed 3rd December, 1849.]

THIS invention refers, firstly, to improvements in the manufacture of axletree-boxes for carriages; secondly, to improvements in the manufacture of bearings of the axles of railways; and thirdly, to an alloy of metal suitable for such and the like purposes.

In Plate III., fig. 1, shews a section, and fig. 2, a plan of an axletree-box, lined with a soft alloy of metal. The improvement consists in forming a lining, by pouring into the box proper soft metal, which will fill the space between the axletree and the box, and become fixed to the interior of the box, by the soft metal filling the openings in the interior of the box. *a, a,* is the box; *b,* is the axle on which the box is to turn; and *c, c,* is the lining of soft metal. The molten metal is poured into the box at any of the holes *d, d*;—the end at *e,* being closed by a metal plate or otherwise, to prevent the fluid metal escaping in that direction. In order to obtain a groove or recess for containing oil within the box, a fillet or ribbon, of any thin fabric, is wrapped tightly round the axletree, as shewn at *f, f,* which will prevent the box being lined at that part. The patentee remarks, that similar recesses have before been made in axletree-boxes,—he therefore makes no claim thereto, but limits this part of his invention to the mode of making and retaining suitable soft metal linings within the boxes, as explained.

Fig. 3, shews a bearing of a railway axle, made according to the second part of the invention. The interior and the ends of the bearing consist of soft metal, which is cast on to a shell, shewn at fig. 4. This shell is considerably less in its dimensions than the actual bearing of the soft metal cast thereon, constituting the bearing. The shell *a,* is formed with dovetail notches at a^1, a^1, as shewn, into which the soft metal runs, and by which the soft metal and the shell are combined strongly together. In casting bearings, according to this part of the invention, metal moulds, such as those shewn in the drawing, are employed;—one part of the mould being suitable for receiving the shell *a,* and the other part of the mould being suitable for producing the interior of the bearing (of soft metal) to correspond with the axle which is

to run therein, and at the same time leave a space between the parts of the mould and shell *a*, to admit of the soft metal bearing being formed on to the shell. This will readily be understood by reference to the several parts of the mould shewn detached, of which fig. 5, is an under side view, and fig. 6, an edge of the upper portion of the mould; fig. 7, is a plan view of the lower part of the mould; and fig. 8, is a longitudinal section, fig. 9, a transverse section, and fig. 10, an end view of the two portions of the mould combined together. The mould, before casting therein, is to be heated to about 600° or 700° Fahr.; and such is also to be the case in respect to the shell; and, in order to prevent the cast metal adhering to the mould, the interior surfaces are to be smoked. The melted metal is to be poured into the mould by the "jet" or opening at *x*; and, in order to cut off the metal which fills the jet, a knife *y*, (shewn in side and edge view, at figs. 11,) is introduced through an opening *z*, which is kept closed, while the metal is being run in at the jet, by a filling-piece z^1, shewn detached, in side and edge view, at figs. 12. By this arrangement of moulds and shells, railway axle bearings may be made with great facility; and when they have been worn away by use, the soft metal bearings may be re-cast in the same shells.

The third part of the invention consists in making an alloy of metal, suitable for the above and like purposes, by combining zinc, tin, lead, and antimony, in the following proportions:—Seventy-five parts of zinc, eighteen of tin, four and a half of lead, and two and a half of antimony. The zinc is to be melted in a crucible; and, when it is in a state of fusion, the tin and lead are to be added to it. As the antimony rerequires a higher degree of heat to melt it, the patentee prefers to melt it in a separate crucible, and to pour it into the mixture of zinc, tin, and lead, when they are in a state of fusion. He does not confine himself to the exact proportions, although he believes that the above will be found the best for the purpose.

The patentee claims, as his invention, First,—the manufacture of axletree-boxes, as herein explained. Secondly,—the manufacture of bearings of railway axles, herein described. And, Thirdly,—the manufacture of an alloy of metals, herein described, for axletree-boxes, the bearings of railway axles, and like purposes.—[*Inrolled June,* 1850.]

To John Mercer, *of Oakenshaw, in the county of Lancaster, Gent., and* William Blythe, *of Holland Bank, Oswaldtwistle, in the same county, manufacturing chemist, for improvements in certain materials to be used in the processes of dyeing and printing.*—[Sealed 12th October, 1849.]

This invention consists in manufacturing double salts in a solid or concrete state, composed of oxide of tin or stannic acid and phosphoric, arsenic, or arsenious acid and soda, potash, or ammonia, which may be called phospho-stannate of soda, arsenio-stannate of soda, &c.

These double salts are to be dissolved in water, and used for all the purposes for which stannate of soda has been heretofore employed in dyeing and printing cottons and other fabrics. All the double salts of phosphoric, arsenic, or arsenious acid with stannic acid and soda, potash, or ammonia will answer; but the patentees prefer to employ the arsenio-stannate of soda. They make the solid or concrete arsenio-stannate of soda by adding arseniate of soda (made by fluxing or heating together equal weights of white arsenic and nitrate of soda) to stannate of soda in such proportions as will form the strongest solid or concrete salt: this is about equal equivalents of arsenic acid and stannic acid. In one gallon of stannate of soda liquor, at about 50° Twaddle's hydrometer, one pound and a half of arseniate of soda, made as above described, is dissolved in an iron vessel, placed over a fire; a little of the thin mixture, while in a heated state over the fire, is taken out of the vessel and dropped on to a cold plate or stone; and if it immediately concrete into a solid, the fluid may be poured on to any suitable bed or receptacle, and will become solid as soon as cold: the substance, thus produced, is the solid or concrete arsenio-stannate of soda.

Phosphate of soda may be added to stannate of soda, in the same way as the arseniate of soda, in order to produce phospho-stannate of soda; but the patentees do not confine themselves to the above mode of adding the arseniate or phosphate soda; for the arseniate or phosphate may be added to the soda before the oxide of tin, or before the soda is made into stannate of soda. The arseniate of soda, arsenious acid, or phosphate of soda, may be added before, at the same time, or after the oxide of tin or stannic acid is united to the soda; and in each case the same arsenio-stannate or phospho-stannate of soda will be formed.

The patentees claim, as their invention, the sole manufac-

ture and use of the solid or concrete double salts, composed of arsenic acid, or arsenious acid and stannic acid and soda, potash, or ammonia, and of phosphoric acid and stannic acid and soda, potash, or ammonia.—[*Inrolled April,* 1850.]

To ROBERT MILLIGAN, *of Harden, near Bingley, in the county of York, manufacturer, for an improved mode of treating certain floated warp or weft, or both, for the purpose of producing ornamented fabrics.*—[Sealed 18th Mar., 1850.]

THIS invention consists in printing in bright and clear or delicate colors on warp or weft which has been floated on the colored ground of any woven fabric for that purpose, in order to ornament such fabric more highly than could be done without the aid of such floated warp or weft.

Supposing it is desired to ornament a dark grey alpaca mixture with a bright rose flower, it will be evident that the mere printing of a rose with a bright color on the dark grey alpaca mixture would not produce a pleasing effect; the patentee, therefore, in weaving the said mixture, carefully floats on the surface of the same the figure of a rose, wherever it is intended to print the same,—taking care that the material so floated is suited in color and texture to the dye or color intended to be printed thereon.

The above description is applicable to a large class of fabrics; but it is not, in all cases, necessary that the floated warp or weft should correspond with the figure of the subject intended to be printed; for such warp or weft may be floated in stripes, and the ornamental subject may be printed thereon at any desired parts of such stripes.

In conclusion, the patentee states, that his invention is equally applicable to grounds which are suitable or unsuitable for the reception and display of bright, clear, and delicate colors. He claims the printing in bright, clear, or delicate colors (either or any such) on warp or weft, suitable in texture and color for the reception and display of the same, and floated on the ground of any fabric; on the ground of which such colors could not have been displayed with so good an effect without such warp or weft floated purposely for the reception and display of such colors, in order to ornament the said fabric.—[*Inrolled July,* 1850.]

To John Holland, *of 2, Lark Hall Rise, in the parish of Clapham, in the county of Surrey, Gent., for a new mode of making steel,—being a communication.*—[Sealed 18th July, 1849.]

This invention consists in the employment, in the manufacture of steel, of silkworm cods or balls (being the remnant of the cocoon with the chrysalis in it, after the silk has been wound off from it), every description of silk wastings, bits and remnants of cocoons, clippings and remnants of old or new pieces of silk stuffs, &c. For purposes of preservation and transport, the chrysalides, the bits or remnants of the cocoons or silkworm cods or balls, and the cocoons themselves, when employed, are to be torrefied, but not carbonized, and then reduced to powder.

To convert bars of malleable iron, such as railway bars, into steel, a layer, an inch thick, of dry coal-dust, coal-slack, powdered coke, or plumbago, or a mixture of any of these substances, is laid on the bottom of the ovens, cases, or furnaces, such as are used for cementation; on this is deposited a layer, one inch thick, of the torrefied substances; upon the latter the bars of iron are laid (care being taken to cover those parts of the iron which are not to be converted into steel with clay, slaked lime, or similar substance); then the ovens, cases, or furnaces, are filled with alternate layers of torrefied substances and carbonaceous matters; and the whole is subjected to the ordinary cementing heat. The time occupied in the process of cementation will depend upon the depth to which it is desired to convert the iron into steel; and the progress of the conversion will be ascertained by the usual tests; but it will be executed in a much shorter period than by the usual process.

The transformation of bars of iron, half an inch thick, into steel, is also effected by the above process, as well as the partial conversion of larger bars; and if such larger bars be required wholly of steel, then smaller bars may be forged, after conversion, into larger ones; and ingots of steel may be made from the smaller bars by the usual process. The partial or entire transformation into steel of manufactured iron articles, such as plough-shares and tools, is produced by the process above described.

To convert iron ore into steel, the ore is first roasted in the usual manner; then broken into pieces of the size of small nuts, walnuts, or even of eggs; afterwards well washed, by means of a sieve or otherwise, to clear off the earth and

sand; and then mixed with a vitrifiable flux, composed of equal parts of powdered clay and slaked lime—together amounting to five per cent. of the weight of the ore. The whole is then to be mixed with water to form a paste, which will serve for enclosing the ore, and preventing the metal from becoming oxidized afresh by contact with the atmospheric air; after which, the ore thus coated, together with what remains of the paste or flux, should be allowed to dry. It is then deposited in closed crucibles or similar vessels with alternate layers (of equal thickness) of the above-mentioned torrefied substances, and melted and run into plates. These plates, when broken into pieces, should be melted into ingots with the addition of five per cent. of malleable iron.

The patentee claims the application of silkworm chrysalides, cocoons, silk, the silkworm, and all its products, and the refuse of the same, in the manufacture of steel.—[*Inrolled January*, 1850.]

Scientific Notices.

PROGRESS OF PATENT LAW REFORM.

In the shape of "a Bill, to simplify the forms and appointments to certain offices, and the manner of passing grants under the Great Seal," now under discussion in the House of Commons, we discover almost the first symptom of a disposition, on the part of government, to carry out the reforms in the patent law which are now so earnestly desired, if not clamorously demanded, by the inventive world. This bill, the principal clauses of which we subjoin, was introduced by the Chancellor of the Exchequer; and, coming from such a quarter, we should look with certainty to its passing into a law, had we not too strong evidence of the practice of abandoning bills, both of greater and lesser moment, as the session draws towards a close. The purport of this bill, as far as its relation to patents of invention is concerned, is to simplify the passing of patents by abolishing the offices of Clerks of the Privy Seal and Signet, and making the Queen's Sign Manual (when countersigned by the Secretary of State, and sealed with the Privy Seal) sufficient authority for the Lord Chancellor to affix the Great Seal to the patent. The consequent effects of this will be (if the bill should outlive the oppo-

sition with which it is threatened* and pass into a law), that those deserving servants of the crown, whose duties are so laborious as to render it impossible that they can work more than one day a week (viz. Friday), unless they receive a refresher of about a guinea a minute for " engrossing the official heading " (their sole occupation), will be liberally compensated by the Commissioners of Her Majesty's Treasury—that the extortion of £5. 3*s*. 0*d*. for *expedition*, and a private seal at this stage of the patent, to prevent delay, will be saved to the patentee,—and perhaps the ordinary fees may be reduced by a further sum of the like amount: we say—*perhaps*, for this trifling reduction in the cost of the patent is by no means certain, but must depend upon the conjoined will and pleasure of the Lord Chancellor and one of Her Majesty's principal Secretaries of State. As far, then, as this alteration goes, there is evidence of a step in the right direction; but we must, once and for all, emphatically protest against a clause in the bill which gives a discretionary power to the Lord Chancellor and one of Her Majesty's Principal Secretaries of State to frame from time to time such rules and regulations, to be observed in the passing of patents, as may seem to them expedient. We have already experienced (in the working of the Registration Act) sufficient inconvenience from the exercise of such a vicarious power, to desire its application to the granting of patents for inventions. So long as a law (whether *scripta* or *non scripta*) exists, it is comparatively easy to frame a course of action to suit its provisions; but when, in lieu thereof, regulations are adopted which may vary in their interpretation as well as form, according to the whim of the parties dictating them, it is obvious that great irregularities of practice must occur. In matters which now come under the cognizance of the Lord Chancellor, and are subject to his "orders," it may be of little consequence when unexpected delays arise; but, in patent matters, when a few days will determine the validity or invalidity of a patent, as respects the novelty of the invention, it is of the greatest moment that the agent should understand his position, and be able to ensure to the patentee the sealing of his patent within a given period. If, therefore, the novel proposition of *orders* in place of Acts of Parliament were not objectionable on other grounds, this (under the pre-

* We find among the "notices of motions" on the books of the House of Commons for Thursday, 1st August, that Mr. John Stuart will move "that the House do resolve itself into a committee (on the bill in question) on that day six months."

sent imperfect system of granting patents) should, we think, be fatal to its adoption.

The bill now before the House has either undergone severe pruning, in some respects for the worse, and in others for the better, or else it is a changeling. As it originally stood, the Bill Office, as well as the Signet and Privy Seal Offices, was to have been abolished—the fee for the Attorney-General's Report was to have been £10, whether opposed or not—and, in place of the fees now paid in the progress of the patent from the Report to the Great Seal, a stamp of £30, on the Sign Manual, was to have been substituted. This would have reduced the ultimate cost of the patent by about £10; but, as parties were required to pay no fee on lodging an opposition to an application for a patent, this branch of business would have increased to a most injurious extent. There was, however, one clause in the original bill which we regret has been abandoned; although the provision for its effectual working was wanting, and would therefore, at first, have caused some inconvenience. Its purport was to make it imperative that particulars of the invention should be deposited at the time of applying for the patent;—in itself a simple provision, but essential to the proper working of the patent system. As the bill now stands, the first clause gives Her Majesty the power of making appointments to offices held during the pleasure of the Crown, by Warrant, instead of by Letters Patent, as at present. The second clause (which we may hereafter have occasion more particularly to notice) confers on the Crown the power of revoking individual appointments, held under Royal Commission, and filling up vacancies in any such Commission, without the necessity for cancelling and wholly renewing the Commission. The third clause repeals an Act of Henry VIII.; and then come the clauses which refer to patents for inventions, and which run as follows:—

"IV. And be it enacted, that in every case where, under the said Act of the twenty-seventh year of King Henry the Eighth, or according to the law or usage subsisting before the passing of this Act, any gift, grant, or writing whatsoever, to be passed under the great seal of the United Kingdom, would have required bills or warrants from the Offices of the Signet and the Privy Seal respectively, it shall be lawful for Her Majesty, by bill or warrant under her royal sign manual, addressed to the Lord High Chancellor or Lord Keeper of the Great Seal of the United Kingdom, to command such Lord Chancellor or Lord Keeper (as the case may be) to cause letters patent to be passed under the Great Seal of the United Kingdom, according to the

tenor of such bill or warrant; and every such bill or warrant shall be countersigned by one of Her Majesty's Principal Secretaries of State, or by the Lord High Treasurer, or two of the Commissioners of Her Majesty's Treasury, and shall be sealed with the Privy Seal, and subscribed by the Lord Keeper of the Privy Seal for the time being, for which sealing and subscription such royal sign manual, so countersigned as aforesaid, shall be sufficient warrant to such Lord Keeper of the Privy Seal; and such bill or warrant under the royal sign manual, so countersigned, sealed, and subscribed as aforesaid, shall be a sufficient authority to the said Lord High Chancellor or Lord Keeper of the Great Seal for passing letters patent under such Great Seal, according to the tenor of the same bill or warrant, any law or usage to the contrary in anywise notwithstanding.

"V. Provided always, and be it enacted, that on the grant of any letters patent for the sole making, exercising, or using of any invention, and on any other gift, grant, or writing, as aforesaid, where Her Majesty shall think fit to direct her Attorney or Solicitor-General to prepare a bill for letters patent for Her Majesty's signature, the Queen's bill for such letters patent shall be prepared by or under the direction of such Attorney or Solicitor-General, in the same manner, and the same proceedings previously to the preparation of such bill shall be had and observed, as have been had and observed in the preparation and previously to the preparation of a Queen's bill for letters patent before the passing of this Act; and, except as aforesaid, any such bill or warrant for letters patent, as by this Act provided, may be prepared under the direction of one of Her Majesty's principal Secretaries of State, or of the Lord High Treasurer or the Commissioners of Her Majesty's Treasury.

"VI. And be it enacted, that no Signet bill or Privy Seal bill, or other warrant or authority whatsoever, save as herein provided, shall be necessary for or preparatory to the passing of such letters patent as aforesaid.

"VII. And be it enacted, that, from and after the *passing of this Act*, the several offices of Clerks of the Signet and Clerks of the Privy Seal shall be abolished; and it shall be lawful for the Commissioners of Her Majesty's Treasury to grant such compensation to the persons holding offices hereby abolished as, having regard to the tenure and nature of such respective offices, such Commissioners may deem just and proper to be awarded.

"VIII. And be it enacted, that all powers and duties whatever now exercised or performed by the Clerks of Her Majesty's Signet or otherwise in the Office of Her Majesty's Signet, not superseded or otherwise provided for by this Act, shall be exercised and performed in the Office and under the direction of Her Majesty's Principal Secretary of State for the Home Department, by such persons as such Secretary of State shall from time to time appoint.

"IX. And be it enacted, that it shall be lawful for the Commissioners of Her Majesty's Treasury to determine and regulate the establishment to be maintained after the passing of this Act for executing the duties of the Privy Seal Office, and to fix the salaries to be paid to the several officers of such establishment.

"X. And be it enacted, that it shall be lawful for the Lord High Chancellor or Lord Keeper of the Great Seal of the United Kingdom and one of Her Majesty's Principal Secretaries of State from time to time to frame and establish such further rules and regulations to be observed in the passing of letters patent under the Great Seal of the United Kingdom as shall seem to them expedient; and all such rules and regulations shall be published in the London Gazette.

"XI. Provided always, and be it enacted, that nothing in this Act contained shall extend to or affect any letters patent, writ, commission, or other writing which may be passed under the Great Seal by the fiat or under the authority or directions of the Lord High Chancellor or Lord Keeper of the Great Seal of the United Kingdom or otherwise, without passing through the Offices of the Signet and the Privy Seal.

From a careful reading of the bill, we are disposed to think that, although but little is attempted, yet that little is an improvement;—we are therefore inclined to favor its passing into a law; for, with the exception of clause X (which may possibly be struck out during its progress through the Commons) we see nothing to call forth the opposition of inventors: this is certainly but a negative merit; yet, in this respect, it stands singular as compared with all the other patent bills which we remember to have been brought under the notice of the legislature.

PROPOSED EXTENSION OF COPYRIGHT OF DESIGNS ACT.

To what propitious power are we indebted for having opened to us the garden of the Hesperides? Let us dream no more of ancient fable, and mock the fitful breeze with piteous sighs at the hard lot of fate, in offering us no gatherings of golden fruit; for here is a bill (we had well nigh said an act—so far has it progressed towards fruition) fitted to shower golden apples into the poor inventor's lap. Protection, immediate, certain, costless (perhaps), for eighteen months' duration, will be given to new inventions, great and small, with the power of hawking them from Dan to Beersheba to find a purchaser; and this before a patent is obtained, or even applied for! We may well be expected to demand time before we comment, clause by clause, upon this singular bill, and deliver our solemn

judgment upon its provisions; yet we could not, in conscience, keep back from our readers the food for Hope which this Act, in embryo, is so well calculated to awaken. Should it effect the good it purports, and that without a corresponding drawback, inventors may hail the inauguration of the Industrial Exhibition as the period of their political emancipation; for to the carrying out of this project are they indebted for the bill which is to effect the *provisional registration* of inventions. We would not wish to damp the expectations of those who fancy they can discover something more than glitter in the bill for extending and amending the Acts relating to the Copyright of Designs,—the principal clauses of which we subjoin; but we must caution them against taking it upon trust; for this class of acts has hitherto been drawn by parties wholly unqualified for the task, and we fear that the present specimen will form no exception to the rule. In the event of of its becoming the law of the land, we shall give it a careful and thorough examination, with the view of at once ascertaining its bearings on the industrial community, and urging, if such should be found necessary, an immediate alteration of its provisions. In the meanwhile, we would commend it to the attention of those whom it more immediately concerns, as the design of the bill is good, and should undoubtedly be carried out, if practical means are available for the purpose. The following is the substance of the bill:—

"WHEREAS it is expedient to encourage the exhibition of works of art, and to extend and amend the Acts relating to the copyright of Designs: be it therefore enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present parliament assembled, and by the authority of the same.

"I. That the Registrar of Designs, upon application by or on behalf of the proprietor of any design not previously published within the United Kingdom of Great Britain and Ireland or elsewhere, and which may be registered under the Designs Act, 1842, or under the Designs Act, 1843, or of any new manufacture or invention for which letters patent may by law be granted for the sole making, exercising, vending, or use thereof; and upon being furnished with such copy, drawing, print, name, or description in writing or in print, as in the judgment of the said registrar shall be sufficient to identify the particular design, manufacture, or invention, in respect of which such registration as next hereinafter mentioned is desired, and the name of the person claiming to be proprietor, together with his place of abode or business, or other place of address, or the style or title of the firm under which he may be trading, shall register such

design, manufacture, or invention for the term of one year in such manner and form as shall from time to time be prescribed or approved by the Board of Trade; and any design, manufacture, or invention so registered, shall be called 'provisionally registered,' and the words 'provisionally registered' shall be marked upon or attached thereto; and the said Registrar shall certify, under his hand and seal of office, in such form as the said Board shall direct or approve, that the design, manufacture, or invention has been provisionally registered, the date of such registration, and the name of the registered proprietor, together with his place of abode or business, or other place of address.

"II. That the proprietor of any design, manufacture, or invention, which shall have been provisionally registered, shall, during the continuance of such registration, have the sole and exclusive right and property in the design, manufacture, or invention so registered; and the penalties and provisions of the said Designs Act, 1842, for preventing the piracy of designs, shall extend to the acts, matters, and things next hereinafter enumerated as fully as if those penalties and provisions had been re-enacted in this Act, and expressly extended to such acts, matters, and things respectively, that is to say:

"1. To the application of any provisionally registered design, manufacture, or invention, or any fraudulent imitation thereof, to any article of manufacture or to any substance.

"2. To the publication, sale, or exposure for sale of any article of manufacture or any substance to which any provisionally registered design, manufacture, or invention, shall have been applied.

"3. To the publication, sale, exposure for sale, or fraudulent imitation of any provisionally registered design, manufacture or invention.

"III. That during the continuance of such provisional registration, neither such registration or the exhibition or exposure of any design, manufacture, or invention provisionally registered, or of any article to which any such design, manufacture, or invention may have been or be intended to be applied in any place, whether public or private, in which articles are not sold or exposed or exhibited for sale, and to which the public are not admitted gratuitously, or in any place which shall have been previously certified by the Board of Trade to be a place of public exhibition within the meaning of this Act, nor the publication of any account or description of any provisionally registered design, invention, or manufacture exhibited or exposed, or intended to be exhibited or exposed, in any such place of exhibition or exposure in any catalogue, paper, newspaper, periodical, or otherwise, shall prevent the proprietor thereof from registering any such design under the said Designs Acts at any time during the continuance of the provisional registration, nor shall prevent the

proprietor of any such manufacture or invention from obtaining letters patent for the sole making, exercising, vending, or use of any such manufacture or invention, in the same manner and as fully and effectually as if no such exposure or exhibition or publication had ever been made.

"IV. That if during the continuance of such provisional registration the proprietor of any design or invention provisionally registered shall sell, expose, or offer for sale any article, substance, or thing to which any such design or invention has been applied, such provisional registration shall be deemed to have been null and void immediately before any such sale, offer, or exposure shall have been first made; but nothing herein contained shall be construed to hinder or prevent such proprietor from selling or transferring the sole and exclusive right and property in any such design or invention.

"V. That the Board of Trade may, by order in writing, in any particular case or with respect to any particular class of designs, extend the period for which any design, manufacture, or invention may be provisionally registered under this Act for such term not exceeding the additional term of six months as to the said Board may seem fit; and whenever any such order shall be made, the same shall be registered in the Office for the Registration of Designs; and during the extended term the protection and benefits conferred by this Act in case of provisional registration shall continue as fully as if the original term of one year had not expired.

"VI. That the Registrar of Designs, upon application by or on behalf of the proprietor of any sculpture, model, copy, or cast within the protection of the Sculpture Copyright Acts, and upon being furnished with such copy, drawing, print, name, title, or description, in writing or in print, as in the judgment of the said Registrar shall be sufficient to identify the particular sculpture, model, copy, or cast, in respect of which registration is desired, and the name of the person claiming to be proprietor, together with his place of abode or business or other place of address, or the name, style, or title of the firm under which he may be trading, shall register such sculpture, model, copy, or cast, in such manner and form as shall from time to time be prescribed or approved by the Board of Trade for the whole or any part of the term during which copyright in such sculpture, model, copy, or cast may or shall exist under the Sculpture Copyright Acts; and whenever any such registration shall be made, the said Registrar shall certify under his hand and seal of office, in such form as the said Board shall direct or approve, the fact of such registration, and the date of the same, and the name of the registered proprietor, or the style or title of the firm under which such proprietor may be trading, together with his place of abode or business or other place of address.

"VII. That if any person shall, during the continuance of the

copyright in any sculpture, model, copy, or cast, which shall have been so registered as aforesaid, make, import, or cause to be made, imported, exposed for sale, or otherwise disposed of, any pirated copy or pirated cast of any such sculpture, model, copy, or cast, in such manner and under such circumstances as would entitle the proprietor to a special action on the case under the Sculpture Copyright Acts, the person so offending shall forfeit for every such offence a sum not less than five pounds and not exceeding thirty pounds to the proprietor of the sculpture, model, copy, or cast, whereof the copyright shall have been infringed; and for the recovery of any such penalty the proprietor of the sculpture, model, copy, or cast, which shall have been so pirated, shall have and be entitled to the same remedies as are provided for the recovery of penalties incurred under the Designs Act, 1842; and all pirated copies and casts of any sculpture, model, copy, or cast, which shall have been registered as aforesaid, shall be deemed to be the property of the proprietor of the copyright in such sculpture, model, copy, or cast; and such proprietor shall, after demand thereof in writing, be entitled to recover the same, or damages for the detention or conversion thereof, from any person who shall detain or refuse to deliver up the same: Provided always, that the proprietor of any sculpture, model, copy, or cast, which shall be registered under this Act shall not be entitled to the benefit of this Act, unless every copy or cast of such sculpture, model, copy, or cast, which shall be published by him after such registration, shall be marked with with the word 'registered,' and with the date of registration.

"VIII. That designs for the ornamenting of ivory, bone, papier-maché, and other solid substances not already comprised in the classes numbered 1, 2, or 3 in the Designs Act, 1842, shall be deemed and taken to be comprised within the class numbered 4 in that Act, and such designs shall be so registered accordingly.

"IX. That the Board of Trade may from time to time order that the copyright of any class of designs or any particular design registered or which may be registered under the Designs Act, 1842, may be extended for such term not exceeding the additional term of   years, and the said Board shall have power to revoke or alter such orders as may from time to time appear necessary; and whenever any such order shall be made, the same shall be registered in the Office for the Registration of Designs; and during the extended term the protection and benefits conferred by the said Design Acts shall continue as fully as if the original term had not expired.

"X. That the Board of Trade may from time time make, alter, and revoke rules and regulations with respect to the mode of registration, and the documents and other matters and particulars to be furnished, and the conditions to be fulfilled by persons ef-

fecting registration and provisional registration under the said Acts and this Act, and for the inspection and searching of indexes kept by the Registrar of Designs, and for modifying, altering, or abrogating any existing rules and regulations in that behalf contained in the said Designs Act or this Act; and all such rules and regulations shall be as binding and of the same force and effect as if they were expressly enacted by Parliament: Provided always, that all such rules and regulations shall be published in the 'London Gazette,' and shall forthwith upon the issuing thereof be laid before Parliament, if Parliament be then sitting, and if not then within fourteen days after the commencement of the then next Session; and such rules and regulations, or any of them, shall be published or notified by the Registrar of Designs in such other manner as the Board of Trade shall think fit to direct.

"XI. That if in any case in which the registration of a design is required to be made under either of the said Designs Acts or this Act it shall appear to the Registrar that copies, drawings, or prints, as required by those Acts, cannot be furnished, or that it is unreasonable or unnecessary to require the same, the said Registrar may dispense with such copies, drawings, or prints, and may allow in lieu thereof such specification or description in writing or in print as may in his judgment be sufficient to identify and render intelligible the design in respect of which registration is desired; and whenever registration shall be so made in the absence of such copies, drawings, or prints, the registration shall be as valid and effectual to all intents and purposes as if such copies, drawings, or prints had been furnished.

"XII. That every Certificate of Registration or provisional registration granted under this Act shall be receivable in evidence without proof of the signature thereof or of the seal attached thereto, or of the person signing and sealing being the Registrar of Designs, and shall be *primâ facie* evidence of the design, manufacture, or invention therein referred to having been duly registered or provisionally registered (as the case may be), of the commencement of the period of such registration or provisional registration, of the person therein named as the proprietor being the proprietor, and of the originality of such design, manufacture, or invention, and of a continuance of the copyright in any sculpture, model, copy, or cast therein referred to, and of the provisions of this Act, and of any rule or regulation under which such registration or provisional registration shall have been made having been duly complied with.

"XIII. That in order to prevent the frequent and unnecessary removal of the public books in the office for the registration of designs, the public books in the said office shall not be removed for the purpose of being produced in any Court of Justice, or before any Justice of the Peace, without a special order of a Judge of one of Her Majesty's Superior Courts of Law first had and obtained by the party who shall desire the removal of the same.

"XIV. That the Commissioners of the Treasury may from time to time fix, alter, and regulate the nature and amount of fees to be paid for services performed in the Designs Office under the said Designs Acts and this Act; and so much of the said Designs Act, 1842, as limits the amount of fee in certain cases, shall be and the same is hereby repealed; and the fees which shall be received from time to time shall be applied and accounted for, in the manner in which fees are directed to be applied and accounted for by the said Designs Act, 1842."

ON THE PREPARATION OF GREEN AND GREY COLORS FROM OXIDE OF CHROMIUM, FOR CALICO PRINTING.

BY DR. W. H. DE KURRER, OF PRAGUE.

[Translated for the London Journal of Arts and Sciences.]

GREENS, prepared from oxide of chromium, for cylinder printing, were first introduced into Bohemia in 1840, and soon became universally employed in printing establishments; and immediately upon their adoption came also into use the numerous tints of pearley-grey, likewise obtainable from oxide of chromium. Colors prepared from oxide of chromium possess the valuable property of resisting the action both of light and air, acids and alkalies, and may consequently be classed amongst the fast colors. In preparing these colors for printing cotton fabrics, the substances employed are principally chloride and nitrate of protoxide of chromium, and chromo-sulphate of potash or chrome alum. The chloride of chromium, called also sea-green in the Bohemian manufactories, is employed in the following manner in calico printing establishments, for the purpose of producing the green oxide of chromium. At the commencement of the process, the green hydrate of oxide of chromium is prepared by first dissolving 4 kilogrammes* of bichromate of potash in 22 litres† of boiling water. Then, into a boiler or vessel containing 108 litres of boiling water, 4·5 kilogrammes of pulverized white arsenic are thrown, and boiled for ten minutes; a precipitate will be formed, and must be allowed to settle; the clear liquor is then run off, and immediately mixed with the solution of bichromate of potash, stirring all the time: in a short time the mixture acquires a green tint, and the hydrated oxide of chromium will be formed and precipitated. After being several times well stirred, and allowed to cool, the whole is thrown upon a filter of white wool, and the hydrate of chromium remaining on the filter is carefully washed with boiling water. It is then dried, and is ready to be employed for the preparation of the chloride. In order to obtain the latter salt, hydrochloric acid of 22° Beaumé

* About 2 lbs. English. † About a quart English.

is diluted with water, until the acid no longer gives off vapor. It is then heated, and whilst hot, as much of the hydrated oxide of chromium prepared as above is added, as will saturate the acid and leave a slight excess of the oxide undissolved. The whole is then left to settle, and the clear liquor is decanted from the undissolved matter. In this state the solution of chloride of chromium still presents some traces of free acid, which would act injuriously upon the fibres of the cotton. To remove this, and obtain the product in a neutral state, potash ley (marking 20° Beaumé) is poured in very gradually until the oxide of chromium begins to be precipitated. The solution of chloride of chromium thus prepared, and which is of a dark green color, is evaporated until it marks 46° Beaumé. After cooling, a coloring matter is obtained from it, consisting of oxide of chrome of the finest green color. This preparation is sold under the name of sea-green. Before this substance (which can be used with greater advantage than any other preparation for printing in green upon calico) was known, the following, amongst other preparations, were employed for obtaining chrome green :—

1*st Preparation.*—To a solution of 0·656 kilogrammes of bichromate of potash in 3 litres of water, add 1·406 kilogr. of hydrochloric acid, and afterwards 0·250 kilogr. of pulverized tartaric acid. By the addition of the tartaric acid the solution acquires a fine green tint, together with a sweet taste. The following proportions have been given for producing the various shades of color required :—

	kil.	kil.	kil.	kil.	kil.	kil.
Chromate of potash...	1·750	2·875	1·000	0·500	0·437	0·375
Hydrochloric acid ...	3·125	1·625	1·750	1·000	0·937	0·750
Tartaric acid	2·500	1·625	0·500	0·250	0·172	0·187

All these compounds (which have a slightly acid reaction) are, when used for printing, thickened with starch or wheat flour, gum tragacanth, or other gums; and, to fix the colors, the printed fabrics are, according to the tint required, kept stretched in the air for several days, and then washed; or they are passed through a bath of chalk, or of ammonia. This bath of ammonia is prepared with 24 litres of boiling water, 4 kilogr. of slacked lime, and 2 kilogr. of hydrochlorate or sulphate of ammonia, and the fabrics are submitted thereto by being passed several times through a machine similar to that used for printing ground colors; a free current of air being kept up to carry off the pungent odour of the ammonia.

2*nd Preparation.*—0·500 kilogr. of bichromate of potash are boiled in 3 kilogr. of hydrochloric acid until chlorine ceases to be evolved; 0·500 kilogr. of soda, previously calcined, and 0·500 kilogr. of caustic soda ley, marking 14° Beaumé, are then added; and for printing, the liquor is thickened with gum tragacanth. The piece, when printed and dried, is passed through a boiling ammo-

niacal bath, composed of 0·500 kilogr. of caustic lime, 0·500 kilogr. of hydrochlorate or sulphate of ammonia, and 24 litres of water; after which, it is well washed, and finally stretched and dried.

3rd Preparation.—To a hot solution of 0·656 kilogr. of bichromate of potash in 3 litres of water, 0·500 kilogr. of syrup are added, and afterwards, by degrees, 2 kilogr. of hydrochloric acid, marking 34° Beaumé,—which causes this liquor very shortly to assume a green tint. It is neutralized with caustic soda, the color is thickened as in the first preparation, and the printed fabric is finished in the same manner.

4th Preparation.—Nitrate of chromium is prepared by dissolving in nitric acid the green precipitate of oxide obtained by arsenic in the same manner as the chloride is prepared with hydrochloric acid. This green, thus obtained, gives a yellowish tint upon cotton fabrics.

Printing sea-green with the roller.—For cylinder printing with chloride of chromium, the color must be thickened either with gum tragacanth or starch. The following is the mode of proceeding:—

1. *Thickening with gum tragacanth.*—Take 0·220 kilogr. of gum tragacanth reduced to very fine powder, which make into a thin paste with alcohol; then cover up the vessel in which this operation is carried on, and leave it to settle for a few hours; after which, add 14·250 litres of solution of chloride of chromium, marking 46° Beaumé; leave the whole for from 24 to 36 hours, merely stirring occasionally, and finally strain it through a cloth. When the color is too thick for printing delicate designs from the cylinder, it is only necessary to add more of the solution of chloride of chromium until the desired consistence is attained.

2. *Thickening with starch.*—Mix intimately 2 kilogrammes of starch with 5 litres of water; boil the mixture to the consistence of glue; let it cool, and add the solution of chloride of chromium, marking 46° Beaumé, until it is of the consistence required for printing.

As gum tragacanth is of a denser nature than starch, it furnishes bolder and more intense colors than the latter. After printing, the fabrics are stretched on a frame, and left during the night in a cool place; the next day they are treated with caustic potash lye, marking 2 degrees Beaumé, well aired, pressed as dry as possible, and then laid for about an hour in running water,—washed with washing wheels, pressed and dried, and finally submitted to the process for brightening the colors.

After fixing the yellow, green, and blue colors, by passing them through lime or by immersion in the bath of acid chromate of potash, the operation is completed; the brightest pos-

sible green is obtained by passing the fabric through a bath of acetate of copper, as a portion of the green chromate of copper then combines with the chrome green, and heightens its tone. The operation is conducted as follows:—The proper quantity of water is heated, in a suitable vessel, to a temperature of 55° or 56° Cent., 2 litres of a solution of acetate of copper are added, and the printed pieces are passed twice backwards and forwards through the liquor; they are then placed in running water; after which, the moisture is pressed out of them, and they are dried. When six pieces have been passed through the copper bath in the manner described, 2·375 kilogr. of solution of copper are added for each successive piece, and this is continued so long as there are any pieces to operate upon. The salt of copper gives to the green color a peculiar lustre, without having an injurious influence over the other colors present,—even the chrome-yellow loses none of its beauty. The acetate of copper is prepared by dissolving 20 kilogr. of sulphate of copper or blue vitriol in 72 litres of water,—decomposing by 10 kilogr. of sugar of lead, and using the clear supernatant liquor.

Printing with two green colors.—When, by means of a reserve of arseniate of potash, figures dyed red or violet by madder are stopped out, and the white parts of the fabric printed by hand from a design in relief, with a solution of chloride of chromium thickened with starch or gum tragacanth, then, by afterwards printing over this with sea-green, by means of the cylinder, a dark green pattern will be obtained upon a light grey ground; and after applying the other colors requisite for completing the design, the fabric is passed through a bath of acetate of copper to brighten the greens.

Cylinder printing with yellow designs upon a green ground.—Yellow patterns upon a green ground may be produced by printing (after applying the reserve to protect the madder reds and purples) with the base of lead, and afterwards applying the chrome green with the printing roller. Fabrics thus treated are passed through milk of lime at a temperature of 38° Cent.: they are washed and dried, and then the fast blue, green, and yellow colors are printed; the fabrics are again passed through milk of lime, and after being well washed, the yellow and green colors are brought out by a bath of acid chromate of potash.

The preparation of lead for this purpose consists of the following composition:—3 kilogrammes of pipe-clay are damped with 1·780 litres of water, and mixed with 3·560 kilogr. of gum water, to which is added 1·440 kilogr of a solution of chloride of zinc. For every litre of this solution 0·150 kilogr. of acetate of lead, dissolved in a small quantity of water, is added before printing.

Chrome-olive.—Very fine and fast olive colors may be obtained

suitable for cylinder printing (upon which yellow patterns may be produced by acetate of lead) by means of the following preparations:—

1. *Light olive.*—To 12 litres of solution of chloride of chromium thickened with starch add 2 litres of cachou-brown.

2. *Medium olive.*—To 12 litres of solution of chloride of chromium thickened with starch add 2·350 litres of cachou-brown.

3. *Dark olive.*—To 12 litres of solution of chloride of chromium thickened with starch add 3·560 litres of cachou-brown.

The cachou-brown, which is added to the oxide of chromium or sea-green to form olive colors, is prepared by dissolving 2·5 kilogr. of Gambia cachou in 10 litres of water over a gentle fire, and straining the decoction through a fine sieve; 2·375 litres of this solution are then boiled with 0·150 kilogr. of starch, 0·090 kilogr. of verdigris, and 0·120 kilogr. of sal-ammoniac.

The day after printing, the olive colors may be brought to any desired shade by the following means:—

1. To produce a brown tint, the pieces are introduced into a vat furnished with a drum, and containing milk of lime (at a temperature of 40 Cent.), and afterwards carefully washed. 2. In order to approach nearer to an olive green, instead of milk of lime, they are passed four or five times over the drum (a single piece at a time, and in one direction only), through a bath of acid chromate of potash. 3. When it is desired to bring the above colors to a more decided green, the pieces, after having received all the colors required, viz., the yellow, the fast blue and green, and also the sea-green, are passed through a bath of acetate of copper, heated to 60° Cent.

Cylinder printing in green by means of arseniated chloride of chromium.—Shades of green may be obtained, differing somewhat from the ordinary sea-green, by the employment of arseniated chloride of chromium, prepared in the following manner: In a large earthen vessel a mixture of 4 kilogr. of hydrochloric acid and 9 litres of water, are heated to ebullition on a sand bath; to the liquor is added 3 kilogr. of bichromate of potash. When the solution is complete, 3·650 kilogr. of finely-pulverized white arsenic are introduced in small quantities, in order that the liquor may not rise and overflow. When the arsenic is likewise completely dissolved, the solution is allowed to cool;—the clear liquor, when decanted, is kept ready for use.

For immediate use 1 kilogr. of starch and 0·060 kilogr. of finely-powdered gum tragacanth are boiled in 8 litres of water and the mixture is allowed to cool. Into 8 litres of this thickening mixture 32 kilogr. of arseniated chloride of chromium are slowly poured, and when properly mixed 6·5 kilogr. of potash ley of 16° Beaumé are added very gradually, stirring briskly all the time. The color appears very thin before the addition of the potash;

but it is thereby thickened and rendered suitable for cylinder printing. The fabrics printed with this preparation are the next day passed through a weak potash ley (heated to 60° Cent.), to which a small quantity of milk of lime has been added; they are then well washed, stretched, and dried.

To produce a fast green color, approaching to grey, take 12 litres of green printing color, and 2.375 litres of fast blue, prepared from indigo, mix them together, print the fabrics therewith, and next day pass them through milk of lime; wash with clean water, and stretch and dry them as before.

In order to *impregnate* the fabric with the color by means of the cylinder machine, so as to produce a uniform green ground, mix gradually 71 litres of the solution of arseniated chloride of chromium, marking 55° Beaumé, with 6·500 kilogr. of solution of potash, of 16° Beaumé, diluted with about 15 litres of water; then add 3 kilogr. of mucilage of gum tragacanth, and 0·040 kilogr. of chloride of iron, and 0·067 kilogr. decoction of logwood, of 2° Beaumé.

Pearl-grey color for printing.—This pleasing color is obtained by means of sulphate of chromium, and of potash (chrome alum). It is prepared in the following manner:—Into four large stone vessels are severally poured 2 kilogr. syrup of sugar, and 2 kilogr. of thick gum-water, prepared by dissolving 1·50 kilogr. of gum in 1·25 litres of water. Into each vessel a hot solution of 2 kilogr. of bichromate of potash in 6 litres of water is then poured, the mixture being briskly stirred. After being allowed to cool down to 30° Cent., 2·50 kilogr. of colorless sulphuric acid diluted with water (say 2 kilogr. acid, and 3 litres water) are added, again stirring briskly. After the lapse of a short time, the liquor will become spontaneously heated, and rise rapidly. In order that no loss may arise, the liquor which may overflow should be received in another vessel. The color gradually changes from orange to olive-green, and finally to dark grey. It must be stirred from time to time until the liquor ceases to froth up, when it will be found to have acquired a fluid consistency, and a blackish-grey color. As soon as the rising ceases, that which had overflowed is poured back again, and, when perfectly quiescent and cold, the contents of the four pots are mixed together,—when the liquor will be ready for use, it being found to consist of a compound or mixture of sulphate of chromium, with sulphate of chromium andpotash (chrome alum).

This color will be found well adapted for cylinder printing, which is performed in the ordinary manner of printing with starch colors, viz., by introducing a cylinder provided with a woollen band into the dye-vat, from which the color is fed to the engraved cylinder. Ten pieces of calico may be easily printed off with this color without changing the doctors, as they are not affected by it.

The next day after printing, the fabrics are stretched upon frames, and immersed during six minutes in a vat filled with milk of lime; they are then left for an hour in running water, and passed through a bath of hot water to dissolve all the reserve, in order that this may be completely washed out in the washing machine; and they are afterwards dried.

Green patterns upon a pearl-grey ground.—These may be obtained perfectly fixed by preserving the madder reds and violets with the reserve of arseniuret of potassium, then printing on the white ground the patterns in sea-green, and afterwards with the cylinder applying the pearl-grey color.

Yellow patterns on a pearl-grey ground.—These are produced with the preparation of lead, in the same manner as above described for sea-green.

Yellow, green, blue, and cachou-brown colors may be advantageously applied to the above; and in passing through a bath of milk of lime and another of yellow and neutral chromate of potash, the yellow and green will be brought out, and the cachou-brown fixed.

The bath of neutral chromate of potash, for bringing out and fixing the colors, is prepared in the following manner:—Into a vat, provided with a drum, and three parts filled with water, a solution of 3 kilogr. of neutral chromate of potash is poured, to which are added not more than from 4·750 litres to 5 litres of vinegar, in order that it may not be acid, as bichromate or acid chromate of potash would convert the pearl-grey into chromate of chromium, which is of a brownish-yellow color. The yellow, to be good, should appear in the bath of neutral chromate of potash of a brimstone color,—the green having always, on the contrary, a pear-green tinge; consequently, in printing in pearl-grey, should a fine grass-green be required, a good steam color must be resorted to.

Pearl-grey, approaching to blue.—To produce this color, the sulphate of chromium and potash must be prepared as follows:—In 6 litres of water 4 kilogr. of bichromate of potash, in small pieces, are dissolved; 2·5 kilogr. of colorless sulphuric acid are diluted with 2 litres of water, and this dilute acid, when cold, is poured slowly into the solution of chromate, which is stirred; then add 2 kilogr. of powdered sugar, in small portions at a time,—which addition will cause an elevation of temperature and great effervescence. When the mixture is cold, the sulphate of chromium and potash possesses a certain degree of consistence, and, for printing, the following proportions of syrup and British gum are added as thickening matter:—1st. 2.375 litres of syrup are diluted with 2·375 litres of water, and added to 4·750 litres of solution of chrome alum. 2nd. 3 kilogr. of British gum are boiled in 3 litres of water, and after complete cooling, are poured into 4·750 litres or

the solution of chrome alum. Neither dry gums nor gum water will serve as thickeners for this color, as gums contract and form with the double sulphate of chromium and potash a hard matter resembling leather. The printed fabrics are next day passed through milk of lime, and treated in the manner above mentioned. If to 12 litres of the pearl-grey about 1 litre of the cachou color, prepared in the same manner as for chrome olive, be added, a peculiar reddish-grey color will be produced.

Chrome-green printing color.—A very fine green color (suitable for printing stripes upon cotton) may be produced by preparing chloride of chromium in the following manner: 4 kilogr. of pulverized white arsenic are dissolved in 106 litres of water by the application of heat; 3·5 kilogr. of bichromate of potash are also dissolved by heat in 14 litres of water, and this solution is poured slowly (stirring continually) into the arsenious solution. After cooling, the green precipitate is thrown upon a cloth, and when well drained, 5 kilogr. of hydrochloric acid of 22° Beaumé are added to it; it is then dissolved in a sand bath and evaporated to 4° Beaumé, neutralized by means of 1·750 litres of soda ley at 20° Beaumé, stirring continually; and, finally, the liquor is thickened with 100 grammes of gum tragacanth, finely powdered;— when it will be fit for printing. The fabrics thus printed are left for 24 hours in a cool place, and then dried.

Steel green-grey steam color.—To prepare this color, which is chiefly employed for printing cotton stripes, the chrome alum is prepared as follows:—Into a solution of 7·5 kilogr. of bichromate of potash in 15 litres of water, pour slowly 4·625 kilogr. of colorless sulphuric acid, and mix gradually with the liquor 1·875 kilogr. of raw sugar. The stone vessel in which this solution is effected is kept hot in a sand bath, until the mixture has acquired an emerald-green color, when it may be left to cool.

Color for printing.—To 2·375 litres of starch paste, prepared with 0·360 kilogr. of that substance, are successively added 7·125 kilogr. of chrome alum, 9·5 kilogr. of cachou-grey, and 0·900 kilogr. of acetic acid of 3° Beaumé.

To prepare the cachou-grey, dissolve 4 kilogr. of Gambia cachou in 24 litres of wood spirit, and add 1·780 litres of gum-water for each 1·780 litres of the cachou solution: the grey color is finally obtained by the addition of 0·060 kilogr. of green vitriol.

This color requires most particularly to be steamed, as the green and other steam colors, which are easily affected, would be changed by the acetic acid, which is otherwise carried off in the form of steam.

ON THE REFINING OF GOLD.

BY M. LE DOCTEUR PHILIPP.

The process of refining gold by the dry method, called the process of cementation, has been long known, although it has sometimes been considered a secret, and is employed by but very few persons for refining alloyed gold,—its use being principally to remove from that metal bodies which form an obstacle to its malleability. Experiments have been made for completely refining gold by way of cementation; but, in operating thus, loss of the precious metal has been observed, on the one hand, and, on the other, sufficient purity has not been obtained; the consequence of which is that the old processes have been retained. After numerous experiments, M. Philipp has arrived at the conclusion that, by means of cementation, gold may be obtained of the greatest possible purity, that is to say, of the quality known in commerce as fine gold. The success of this very simple operation depends 1stly, upon the choice of the ingredients used for cementation; 2ndly, upon the preparation of the mass; 3rdly, upon the degree of fineness of the alloy to be treated; and 4thly, upon the temperature employed.

1st. *Ingredients employed for cementation.*—Many receipts have been proposed for this purpose: thus, to refine 1 gramme of gold, the following ingredients have been employed; viz., 6 grammes of brickdust, 2 gr. of sulphate of iron, $\frac{1}{2}$ gr. of alum, 2 gr. sea salt, 1 gr. saltpetre, $\frac{1}{2}$ gr. sal-ammoniac; or 12 gr. of brickdust, 6 gr. of sea salt, 3 gr. of sulphate of zinc, $\frac{3}{4}$ gr. saltpetre; or 6 gr. brickdust, $1\frac{1}{2}$ gr. sal-ammoniac, $\frac{3}{4}$ gr. sea salt, and $\frac{1}{2}$ gr. mineral salt. These receipts did not furnish satisfactory results: in fact, the two first occasion a loss of gold (as the saltpetre and marine salt should not be employed together), and the latter furnishes gold which contains silver.

The following formula is at once more simple and more advantageous, viz.: 3 gr. brickdust, 1 gr. sea salt, 1 gr. alum, and 1 gr. sulphate of iron.

2nd. *Preparation of the mass.*—The sea salt, alum, and sulphate of iron, after being thoroughly dried, are reduced to fine powder, which is added to the brickdust, and mixed intimately until the whole becomes one homogeneous mass. This powder is then damped with a little wine-vinegar, to form a paste, in the midst of which the gold to be operated upon is placed, and the whole is introduced into an earthen vessel or melting-pot. When the gold is in fragments, it may be distributed throughout the mass.

3rd. *Quality of the gold.*—Gold of from 8 to 12 carats is the best adapted for this method of refining. With finer gold, the matters which dissolve the alloyed portions cannot so readily penetrate the mass, as it is not sufficiently porous. If, therefore, the gold is finer, it must be alloyed with copper, until it is of the

desired quality. With gold of less than 8 carats, there is, on the other hand, this inconvenience: that the mass of gold which remains after the operation does not possess sufficient consistency to allow of its being extracted, without loss, from the powder of cementation.

4th. *Temperature employed in the operation.*—The melting-pot, or vessel, is introduced into a charcoal-fire, covered up, and heated slowly, so as not to become red-hot in less than three or four hours. The duration is regulated according to the thickness of the gold, being less for laminated gold and thin leaf gold. A dull red heat appears to be the most advantageous; for, if at the commencement, or during the course of the operation, too great a heat be applied, the decomposition of the materials will be too rapid, and the products will not act sufficiently upon the gold. When the crucible is cold, the powder adhering to the gold is carefully detached and completely removed by means of boiling water. The gold in this state is porous and friable, and of a fine pure yellow color. It is fused into a mass with borax.

The following is the explanation of the operation:—In the presence of the sulphuric acid of the sulphate of iron, the sea salt gives off chlorine, which converts the gold into chloride; but, at the temperature indicated, it is reduced to the metallic state, whilst the other metals originally mixed therewith are dissolved in the powder of cementation. The alum delays the operation, and the brickdust, by its interposition, favors the slow and gradual disengagement of the chlorine.

Scientific Adjudication.

The following extract from an American scientific journal will not be without its value to parties holding or interested in American patents:—

"The Supreme Court of the United States, in the case of Wilson, assignee of Woodworth *v.* Forsyth & Simpson, have decided that a person in the lawful possession and use of a patented machine, when a patent is renewed or extended, is not merely entitled to the continued use of the thing patented, according to his interest therein (by virtue of the 18th section of the Act of July, 1836, as decided in Wilson *v.* Rousseau, and in this case when formerly before the court, in 1846), but has also the right to keep the machine in perfect repair; not, however, to the extent of destroying its identity; and that supplying new cutters and knives to Woodworth's planing machine, when the old ones become worn out, are lawful repairs, which may be made without infringing the patentee's extended right."

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1850.

June 28. *Hopwood & Armstrong*, of 184, St. George-street, Well-close-square, for a door and apparatus for closing the opening of ships' scuttles.

29. *Anthony Ettrick*, of Highbarnes, Sunderland, in the county of Durham, for a travelling bag or portmanteau.

July 1. *Charles Cowper*, of Southampton-buildings, Chancery-lane, London, for an addition to a braiding-machine.

1. *Henry Alfred Jowett*, of Sawley, near Derby, for parts of a signal-lamp.

2. *James Woods*, of Stow-market, Suffolk, iron-founder, for an improved bruising and grinding-mill.

3. *George Simpson*, of 29 and 30, Spurrier Gate, York, tailor and draper, for "the York coat or paletôt."

4. *William Walker*, of Manchester, in the county of Lancaster, for an improved ventilating chimney-tube.

4. *John Ashford*, of Birmingham, for an umbrella-rail and water-box for church and chapel pew, carriage and other doors.

5. *Joseph Foxall & Co.*, of 25, Thavies Inn, London, for "the Triunfante pen."

5. *Charles Wilford*, of Brompton, Yorkshire, for a rotary steam-engine.

6. *William Collins, jun.*, of Glasgow, publisher, for a security envelope

6. *Thomas Purdon*, of Hull, for a portable bureau.

9. *Thomas Yates*, of 38, Coleshill-street, Birmingham, for an improved preserve-pot, for mustard, pickles, and other articles.

9. *Anna Maria Breton*, of Lower Berkeley-street, London, for an embroidering frame.

10. *James Carter*, of 8, Lamb's-buildings, Bunhill-row, City of London, and *Johnson Wood*, of 103, Leadenhall-street, City, for "the nautical state-cabin bason."

12. *William Garnett*, of Tarporley, Cheshire, for a spring for a saddle.

12. *William Crosskill*, of Beverley Works, near Hull, Yorkshire, for an improved feeding apparatus for thrashing machines.

July. 12. *Deane, Dray, & Deane,* of King William-street, London Bridge, for an improved steam-boiler.

13. *William Raynard Lane,* of 226, Strand, Middlesex, for "the economic percolator."

13. *William Thomas Loy,* of 24, King-street, Westminster, for "the Tudor razor guard."

13. *Richard Robinson,* of Belfast, engineer and machinist, for a high combustion furnace.

15. *R. Gray & Sons,* of Uddingstone, Glasgow, agricultural implement makers, for a draw spring lever.

16. *Richard Howson & Henry Howson,* of Manchester, in the county of Lancaster, for an improved differential screwing apparatus for presses.

16. *Thomas Key,* of 20, Charing-cross, London, musical instrument maker, for "the improved regimental cased serpentcliede."

17. *Arthur Samuel Hobson,* of Kew, Surrey, for a contracting and elongating parasol.

19. *Charles Ledger,* of 4, Clarence-street, Sheffield, for table cutlery.

19. *James Dannatt,* of Norfolk-street, Bishop Wearmouth, in the county of Durham, plumber, for a domestic mangle.

19. *Isaac & Campbell,* of 21, St. James's-street, Pall Mall, and 71, High-street, Chatham, for barrack, college, and cabin portable furniture.

22. *John Schofield,* of the firm of Joshua and Christopher Schofield, of Cornbrook Hulme, near Manchester, in the county of Lancaster, fustian dyers and finishers, and *William Barker,* millwright, in the employ of the said firm, for improved face-plate and cutters for rasping and chipping dyewoods.

22. *William Randel,* of Birmingham, jeweller, for a hook and eye.

23. *François Jules Livin Tigé,* of 9, Arthur-street, West, London, for a bath.

25. *Ann Remington,* of 11, Shaftesbury-crescent, Pimlico, for improved roasting apparatus.

26. *John Wright,* of New George-street, Sheffield, for tempering and straightening plates.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th June to the 17th July, 1850, inclusive.

To Thomas Dickason Rotch, of Drumlamford House, in the county of Ayr, Esq., for improvements in separating various matters usually found in certain saccharine, saline, and ligneous substances,—being a foreign communication.—Sealed 24th June.

James Ward Hoby, of Blackheath, in the county of Kent, engineer, for certain improvements in the construction of parts of the permanent way of railways, and in shaping iron.—Sealed 10th July.

Francis Tongue Rufford, of Prescott House, in the county of Worcester, fire-brick manufacturer; Isaac Marson, of Cradley, in the same county; and John Finch, of Pickard-street, City-road, in the county of Middlesex, manufacturer, for improvements in the manufacture of baths and wash-tubs, or wash-vessels.—Sealed 17th July.

George Jackson, of Belfast, Ireland, flax-spinner, for improvements in heckling machinery.—Sealed 17th July.

List of Patents

Granted for SCOTLAND, subsequent to June 22nd, 1850.

To William Wood, of Over Darwen, Lancashire, carpet manufacturer, for improvements in the manufacture of carpets and other fabrics.—Sealed 24th June.

Moses Poole, of the Patent Office, London, for improvements in machinery for punching metals, and in the construction of springs for carriages and other uses,—being a communication. —Sealed 28th June.

Peter Armand le Comte de Fontainemoreau, of 4, South-street, Finsbury, London, patent agent, for certain improvements in the manufacture of sulphate of soda, muriatic and nitric acids,—being a communication.—Sealed 3rd July.

Thomas Dickason Rotch, of Drumlamford House, Ayrshire, for an improved mode of manufacturing soap.—Sealed 3rd July.

William Cormack, of 60, King-street, Dunston-road, Haggerston, in the county of Middlesex, chemist, for certain improvements in purifying gas; also applicable in obtaining or separating certain products or materials from gas, water, and other similar fluids.—Sealed 10th July.

Robert Andrew Macfie, of Liverpool, sugar refiner, for improvements in manufacturing, refining, and preparing sugar; also improvements in manufacturing and treating animal charcoal. —Sealed 10th July.

Richard Roberts, of Manchester, engineer, for improvements in the manufacture of certain textile fabrics; in machinery for weaving plain, figured, and terry or looped fabrics; and in machinery for cutting velvets and other fabrics.—Sealed 12th July.

John Stevenson, of Roan Mills, Dungannon, Tyrone county, flax-dresser, for certain improvements in machinery for spinning flax and other substances.—Sealed 17th July.

James Thomson, of Glasgow, civil engineer, for improvements in hydraulic machinery, and in steam-engines.—Sealed 17th July.

Tempest Booth, of Ardwick, in the county of Lancaster, gum manufacturer, for certain improvements in the method of, and apparatus for, obtaining and applying motive power.—Sealed 19th July.

Peter William Barlow, of Blackheath, Kent, civil engineer, and William Henry Barlow, of Derby, civil engineer, for improvements in the permanent ways of railways.—Sealed 22nd July.

New Patents
SEALED IN ENGLAND.
1850.

To James Thomson, of Glasgow, civil engineer, for improvements in hydraulic machinery, and in steam-engines. Sealed 3rd July—6 months for inrolment.

Richard Winter, of New Cross, in the county of Kent, Gent., for improvements in metallic vessels for measuring and holding liquids. Sealed 3rd July—6 months for inrolment.

James Ward Hoby, of Blackheath, engineer, for certain improvements in the construction of parts of the permanent ways of railways, and in shaping iron. Sealed 3rd July—6 months for inrolment.

Paul Rapsey Hodge, of Adam-street, Adelphi, civil and mechanical engineer, for improvements in certain descriptions of steam-engines, and in the apparatus and management for cultivating and manuring the soil, and in treating the produce thereof,—partly a communication. Sealed 3rd July—6 months for inrolment.

Wakefield Pim, of the town or borough of Kingston-upon-Hull, engine and boiler-maker, for certain improvements in the construction of the boilers and funnels of steam-engines. Sealed 3rd July—6 months for inrolment.

William Lancaster, of New Bond-street, in the county of Middlesex, gun-maker, for improvements in the manufacture of fire-arms and cannon, and of percussion tubes. Sealed 3rd July—6 months for inrolment.

John Coope Haddan, of Bloomsbury-square, in the county of Middlesex, civil engineer, for improvements in the construction of carriages and of wheels, and in brickwork. Sealed 3rd July—6 months for inrolment.

Francis Edward Colegrave, of Brighton, in the county of Sussex, Esq., for improvements in the valves of steam and other engines; in causing the driving-wheels of locomotive engines to bite the rails; and also in supplying water to steam-boilers. Sealed 3rd July—6 months for inrolment.

Charles Phillips, of the City of Bristol, engineer, for improvements in apparatus or machinery for cutting turnips, and other similar substances, as food for cattle. Sealed 3rd July—6 months for inrolment.

Richard Hornsby, of Spittlegate, Grantham, in the county of Lincoln, agricultural implement manufacturer, for improvements in machinery for sowing corn and seeds, and depositing manure; in thrashing-machines; in machines for dressing or winnowing corn; and in steam-engines and boilers for agricultural purposes. Sealed 3rd July—6 months for inrolment.

Charles Starr, of New York, in the United States of America, for improvements in book-binding. Sealed 3rd July—6 months for inrolment.

James Kingsford, of Essex-street, Strand, Esq., for improvements in refrigerating and freezing. Sealed 3rd July—6 months for inrolment.

Weston Tuxford, of Boston, in the county of Lincoln, for improvements in machinery for crushing or pressing land, and for shaking straw; also improvements in applying steam-power to agricultural machinery. Sealed 4th July—6 months for inrolment.

Henry Pratt, of New Bond-street, in the parish of St. George, Hanover-square, in the county of Middlesex, camp equipage manufacturer, for improvements in the construction of portmanteaus and travelling trunks. Sealed 9th July—6 months for inrolment

Alfred Vincent Newton, of Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the preparation and manufacture of caoutchouc or India-rubber,—being a communication. Sealed 9th July—6 months for inrolment.

Robert Rumney Crawford, of Warden Paper Mill, in the county of Northumberland, paper-maker, for an improvement in drying paper. Sealed 10th July—6 months for inrolment.

Jacob Connop, of Hyde-park, in the county of Middlesex, Gent., for improvements in melting, moulding, and casting sand, earth, and argillaceous substances, for paving, building, and various other useful purposes. Sealed 10th July—6 months for inrolment.

James Hill, of Stalybridge, in the county of Chester, cotton-

spinner, for improvements in or applicable to certain machines for preparing cotton, wool, and other fibrous substances for spinning and doubling. Sealed 15th July—6 months for inrolment.

Tempest Booth, of Ardwick, in the county of Lancaster, gum manufacturer, for certain improvements in the method of and apparatus for obtaining and applying motive power. Sealed 15th July—6 months for inrolment.

Edward N. Smith, of West Brookfield, of the State of Massachusetts, in the United States of North America, for a machine to fold paper. Sealed 17th July—6 months for inrolment.

Edward John Dent, of the Strand, in the county of Middlesex, chronometer-maker, for improvements in compasses for navigation, surveying, and similar purposes. Sealed 17th July—6 months for inrolment.

William Herbert Gossage, of Stoke Prior, in the county of Worcester, chemist, for improvements in obtaining certain metals from some compounds containing such metals; and in obtaining other products by the use of certain compounds containing metals. Sealed 17th July—6 months for inrolment.

Jean Jules Varillat, of Rouen, in the Republic of France, manufacturing chemist, for improvements in the extraction and preparation of coloring, tanning, and saccharine matters, from various vegetable substances; and in the apparatus to be employed therein. Sealed 17th July—6 months for inrolment.

John Melville, of Upper Harley-street, in the county of Middlesex, Esq., for certain improvements in the construction of railways, and locomotive engines and carriages. Sealed 17th July—6 months for inrolment.

Henrietta Brown, of Long-lane, Bermondsey, widow and executrix of the late Samuel Brown, for improvements in the manufacture of metallic casks and vessels,—being a communication. Sealed 17th July—6 months for inrolment.

John Silvester, of West Bromwich, in the county of Stafford, whitesmith, for improvements in straightening, flattening, setting, and shaping hardened steel. Sealed 17th July—6 months for inrolment.

Ezekiel Edmonds, the younger, of Bradford, in the county of Wilts, cloth manufacturer, for improvements in the manufacture of certain descriptions of woollen fabrics. Sealed 17th July—6 months for inrolment.

Henry Bessemer, of Baxter House, Old St. Pancras-road, in the county of Middlesex, civil engineer, for certain improvements in figuring and ornamenting surfaces, and in the blocks, plates, rollers, implements, and machinery employed therein. Sealed 22nd July—6 months for inrolment.

James Bradford, of Torquay, in the county of Devon, jeweller, for improvements in locks and other fastenings. Sealed 22nd July—6 months for inrolment.

Thomas Mills, of Bow, in the county of Middlesex, engineer, for improvements in steam-engines and in pumps. Sealed 22nd July—6 months for inrolment.

Joseph Paxton, of Chatsworth, in the county of Derby, Gent., for certain improvements in roofs. Sealed 22nd July—6 months for inrolment.

Leonard Bower, of Birmingham, in the county of Warwick, manufacturer, and Thomas Fortune, of Harborne, in the county of Stafford, mechanic, for certain improved machinery for manufacturing screws, bolts, rivets, and nails. Sealed 23rd July—6 months for inrolment.

William Beetson, of Brick-lane, St. Luke's, in the county of Middlesex, brass-founder, for improvements in water-closets, pumps, and cocks. Sealed 23rd July—6 months for inrolment.

William Edward Newton, of Chancery-lane, in the county of Middlesex, civil engineer, for improvements in obtaining, preparing, and applying zinc and other volatile metals, and the oxides thereof; and in the application of zinc or ores, containing the same, to the preparation or manufacture of certain metals or alloys of metals,—being a communication. Sealed 23rd July—6 months for inrolment.

George Hazeldine, of Lant-street, Southwark, in the county of Surrey, carriage-builder, for improvements in the construction of waggons, carts, and vans. Sealed 23rd July—6 months for inrolment.

Henry Constantine Jennings, of Great Tower-street, in the City of London, practical chemist, for improvements in rendering canvas and other fabrics and leather waterproof. Sealed 23rd July—6 months for inrolment.

William Edward Newton, of Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery for cutting files,—being a communication. Sealed 23rd July—6 months for inrolment.

George Dunbar, of Paris, Esq., for improvements in suspending carriages. Sealed 23rd July—6 months for inrolment.

Langston Scott, of Moorgate-street, in the City of London, wine merchant, for improvements in a mode or modes of preparing certain matters or substances to be used as pigments. Sealed 24th July—6 months for inrolment.

Charles William Bell, of Manchester, in the county of Lancaster, for improvements in apparatus connected with water-closets, drains, and cesspools, and gas and air-traps. Sealed 25th July—6 months for inrolment.

CELESTIAL PHENOMENA for August, 1850.

D.	H.	M.	
1			Clock before the ☉ 6m. 1s.
	—		☽ rises 11h. 29m. A.
	—		☽ passes mer. 5h. 55m. M.
	—		☽ sets 1h. 1m. A.
	—		Ceres greatest hel. lat. S.
	—		Occul. *f* Tauri, im. 15h. 37m. em. 16h. 45m.
	5	17	☽ in □ or last quarter
	14	51	☿ greatest hel. lat. N.
2			Occul. γ Tauri, im. 12h. 39m. em. 13h. 25m.
	—		Occul. *a* Tauri, im. 20h. 34m. em. 21h. 24m.
3			Occul. 115 Tauri, im. 16h. 21m. em. 16h. 47m.
	8	5	♄ stationary
5			Clock before the ☉ 5m. 43s.
	—		☽ rises 1h. 32m. M.
	—		☽ passes mer. 9h. 37m. M.
	—		☽ sets 5h. 42m. A.
	9	28	♅ stationary
6	11	43	♀ in conj. with ♃ diff. of dec. 0. 24. S.
7			☉ eclipsed, invis. at Greenwich
	1	0	☽ in Perigee
	8	20	♃'s second sat. will em.
7	9	34	Ecliptic conj. or ● new moon
8	0	9	☿ in conj. with the ☽ diff. of dec. 0. 51. N.
9			Ceres stationary
	18	54	♂ in conj. with the ☽ diff. of dec. 2. 35. S.
	22	10	♃ in conj. with the ☽ diff. of dec. 2. 19. S.
10			Clock before the ☉ 5m. 7s.
	—		☽ rises 7h. 50m. M.
	—		☽ passes mer. 2h. 33m. A.
	—		☽ sets 9h. 3m. A.
	3	48	♀ in conj. with the ☽ diff. of dec. 3. 13. S.
14	5	46	☽ in □ or first quarter.
	10	43	♂ in conj. with ♃ diff. of dec. 0.27. S
	—		Occul. γ Lybrae, im. 8h. 30m. em. 9h. 41m.
15			Clock before the ☉ 4m. 17s.
	—		☽ rises 1h. 55m. A.
	—		☽ passes mer. 6h. 39m. A.
	—		☽ sets 11h. 17m. A.
17	—		Mercury R. A. 10h. 47m. dec. 8. 41. N.

D.	H.	M.	
17			Venus R. A. 12h. 19m. dec. 1. 56. S.
	—		Mars R. A. 11h. 47m. dec. 2. 7. S.
	—		Vesta, R. A., 10h. 50m. dec. 12. 13. N.
	—		Juno, R.A., 13h. 35m. dec. 0. 48. S.
	—		Pallas, R. A., 21h. 42m. dec. 9. 32. N.
	—		Ceres R. A. 0h. 54m. dec. 9. 57. S.
	—		Jupiter R. A. 11h. 43m. dec. 3. 2. N.
	—		Saturn R. A. 1h. 20m. dec. 5. 40. N.
	—		Georg. R. A. 1h. 53m. dec. 11. 3. N.
	—		Mercury passes mer. 1h. 6m.
	—		Venus passes mer. 2h. 37m.
	—		Mars passes mer. 2h. 5m.
	—		Jupiter passes mer. 2h. 0m.
	—		Saturn passes mer. 15h. 36m.
	—		Georg. passes mer. 16h. 9m.
	15	5	☿ in conj. with Vesta, diff. of dec. 3. 52. S.
18			Occul. x^1 Sagittarii, im. 6h. 44m. em. 8h. 4m.
19	9	29	♀ in the descending node
20			Clock before the ☉ 3m. 13s.
	—		☽ rises 6h. 11m. A.
	—		☽ passes mer. 10h. 39m. A.
	—		☽ sets 2h. 13m. M.
	3		☽ in Apogee
22	9	12	Ecliptic oppo. or ○ full moon
22	19	11	Pallas in oppo. to the ☉ intens. of light 0·379
	—		Occul. 42 Aquarii, im. 8h. 36m. em. 9h. 19m.
25			Clock before the ☉ 1m. 57s.
	—		☽ rises 8h. 21m. A.
	—		☽ passes mer. 1h. 38m. M.
	—		☽ sets 7h. 26m. M.
	2	43	☿ in the descending node
26	7	7	♃'s first sat. will em.
	11	54	♄ in conj. with the ☽ diff. of dec. 2. 15. N.
27	4	36	♅ in conj. with the ☽ diff. of dec. 4. 17. N.
28	10	36	☿ in conj. with ♃ diff. of dec. 1. 34. S.
30	2	18	☽ in □ or last quarter

J. LEWTHWAITE, Rotherhithe.

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No. CCXXV.

RECENT PATENTS.

To Alfred Barlow, *of Friday-street, in the City of London, warehouseman, for certain improvements in weaving.*—[Sealed 2nd November, 1849.]

This invention consists of certain additions to or variations in the construction of Jacquard or other similar apparatus used in connection with looms for weaving figured patterns;—the object of these improvements being, to cause such looms to work with greater expedition than heretofore. For the purpose of obtaining this advantage, the patentee makes some parts of such apparatus double, or double acting; and, in doing this, he is also enabled to make some of the working parts act as a counterpoise to some of the other parts.

In Plate IV., a Jacquard apparatus, constructed with the improvements, is shewn in several figures, detached from the loom, and, on a reduced scale, applied to a power loom,—the loom being shewn in section. Fig. 1, is an elevation of the improved arrangement of Jacquard apparatus, shewn partly in section, the better to exhibit its construction; fig. 2, is a sectional elevation, taken at right angles to fig. 1; and fig. 3, is a sectional plan, taken at a line above the horizontal needles. The several parts of the apparatus are carried by the main framing *a, a,* which is bolted to a bottom plate *b,* pierced with holes, through which the stringing or cords for connecting the hooks of the Jacquard apparatus with the harness of the loom pass freely. The driving-shaft *c,* receives motion from the tappet-shaft of the loom, and communicates

the same to the Jacquard apparatus. Two disc-wheels *d, d,* are mounted upon this shaft; and to each of the disc-wheels three arms *e, e*,* and *f,* are jointed. The peculiar construction of these disc-wheels will be seen most clearly in the detached views, figs. 4. The pair of arms *e, e,* are severally attached, at their upper ends, to a griff *g*; and the other pair of arms *e*, e*,* are attached, in like manner, to the griff *g**. These griffs have an alternating up-and-down motion given to them by means of the arms,—the one of them ascending as the other is descending; so that they may be enabled to cause the hooked wires *h,* and *h*,* alternately and simultaneously to rise and fall, as required. The two pairs of vertical guide-rods *i, i,* and *i*, i*,* are for guiding the griffs *g,* and *g*,* in their upward and downward movements. The two inner rods *i, i,* are made longer than the other pair, and serve to guide the movements of the cross-head *k,* to which the arms *f, f,* are attached.

This Jacquard apparatus is provided with two card-cylinders or bars *l,* and *l**; which are mounted in the ordinary manner, but one on each side of the framing. These cylinders act upon two distinct sets of horizontal needles *y,* and *z,* which are mounted in the ordinary way, so as to cause such of them as may be pressed by the cards to drive the hooks of the wires *h,* and *h*,* with which they are in connection, out of the reach of the bars of the ascending griff. The cards are so prepared and arranged, that each cylinder will carry one-half of the pattern,—that is to say, one cylinder will have the odd and the other the even numbers of the cards, as indicated by the numbers 1, 3, 5, and 2, 4, 6, at fig. 1; and, by these cylinders acting alternately upon the horizontal needles, the successive changes in the shed necessary to produce the desired pattern will be effected in like manner, as in the ordinary plan of working.

The cylinders *l,* and *l*,* are respectively mounted in the rocking-frames *m,* and *m*,* which hang on pins carried by the brackets *n, n,* at the upper end of the framing *a, a.* Attached to each of these frames *m, m*,* is an inclined piece *o,* and *o*,* terminating, at its lower end, in a hook o^1. Each of these inclined pieces is acted upon by a friction-roller *p,* mounted in a projecting arm, fixed upon the griff at the side next such inclined piece, so as to press outwards the frame to which such inclined piece is attached, and thus draw the cards upon the card-cylinders out of contact with the horizontal needles. The catches *q, q*,* are jointed to the framing *a,* and lie immediately over the rounds of the lantern of the card-

cylinders,—their object being to pull round their respective card-cylinders in the ordinary way at every outward movement of the rocking-frames *m*, *m**, which carry those cylinders, and thus to bring a fresh card into contact with the ends of the needles to be operated upon. The stems of the several hooks *h*, and *h**, are each provided with an eye; and they are connected together in pairs by the stem of a suspending wire or middle wire hook *j*, or *j**, being passed through the eye of each of two adjacent hooked wires *h*, and *h**:—one of each pair of wire hooks is acted upon by the griff *g*; and the other by the griff *g**.

To the lower ends of the middle wire hooks, shewn at *j*, and *j**, the stringing for working the harness of the loom is suspended. Each of these middle wires is provided with two stop-pieces *, and *, so placed, that the eye of either of the pair of hooked wires *h*, or *h**, coming in contact with one of the stop-pieces *, will lift the middle or suspending wire, and with it the part of the harness suspended to it. The upper ends of the wires *j*, and *j**, slide in the moveable cross-head *k*, which is suitably pierced for that purpose; and, their ends being bent round, the wires will thus be prevented from escaping from the cross-head. The design and operation of this moveable cross-head *k*, will be pointed out hereafter. *r*, *r*, are two spring-pressers, which act upon their respective lanterns at the ends of the card-cylinders, and keep them in their proper position, but spring back or yield, so as to allow the cylinders to be turned by the catches *q*, and *q**. The ends of all the middle wire hooks, when in their lowest position, rest upon the cross-head *k*.

The apparatus just described is shewn at fig. 5, as mounted on the top framing of a loom; and it receives motion from the loom in the following manner:—A, is a shaft, mounted on the main framing of the loom, and receiving rotary motion by means of gearing from the crank-shaft B. This shaft A, carries two excentrics C, C, provided with metal straps, to which two vertical rods C*, C*, are respectively attached. The rods are retained in their vertical position by being jointed to the rocking-arms D, D, which are supported by a stud in the top framing. To the upper ends of the rods C*, C*, the ends of a cord E, (which is coiled round a pulley F, on the shaft *c*, of the Jacquard apparatus) is attached. At every rotation, therefore, of the excentric shaft A, a reciprocating rotary motion will be communicated to the shaft *c*, and thereby to the disc-wheels *d*. This motion will, through the medium of one pair of arms *e*, *e**, carry up one of the griffs *g*, *g**, to its

highest position, and simultaneously draw down the other to its lowest position—communicating, at the same time, corresponding movements to such of the hooked wires as may have taken hold of the bars of the griffs. During this change of position of the griffs, the friction-roller of the ascending griff (say the griff *g**,) will, in passing over the incline *o**, of the frame *m**, force out that frame, together with its card-cylinder, and, by a round in the lantern of the card-cylinder coming in contact with the catch *q**, that cylinder will be turned a quarter of a revolution,—whereby a fresh card will be placed, so as to be ready to be presented to the ends of the horizontal needles. At the same time, the other griff *g*, with its friction-roller, will descend and allow the frame *m*, to fall inwards, and bring a card into contact with the ends of such of the needles as it may be intended to operate upon. Those needles, the ends of which are opposite the spaces in the card, will remain quiescent; but the other needles will be forced inwards by the pressure of the card. Such of the needles as remain quiescent will allow the hooked wires, with which they are respectively connected, to retain the proper position for taking hold of the bars of the griff *g*, upon its ascent, and so be lifted by it; while those needles *y*, which are driven in, will force back the hooked ends of the wires *h*, and cause them to miss the cross bars of the ascending griff in the ordinary way. By the upward movement of the wires *h*, their eyes will be brought into contact with one of the stop-pieces *, of their respective middle or suspending wires *j*, and made to lift these wires, and, consequently, also the harness and warp-threads with which the wires *j*, are connected; and, by these means, the desired open shed will be formed for the passage of the shuttle. When it is requisite, in the formation of a pattern, that any of these raised threads should again be raised, in forming the next succeeding opening of the shed, the card-cylinder, which acts upon the set of needles *z*, (which needles are connected with the hooked wires *h**,) will present a card suitably pierced to miss the particular needles which govern the motions of the hooked wires *h**, in connection with those central wires *j*, which lifted the threads in question. These hooked wires *h**, will therefore retain the proper position for taking hold of the bars of the griff *g**, and being again lifted when the next succeeding alternating motion of the griffs causes the descent of the griff *g*, and the ascent of the griff *g**. Those middle wires *j*, which are again to be lifted, in forming the next succeeding shed, will descend to about half the distance they had been previously raised; and

then the eyes of their respective hooked wires h^*, which are being carried up by the griff g^*, will come in contact with one of the stop-pieces upon each of such middle wires, and will cause them again to ascend and carry up their respective threads as before. But when the threads (which at the last formation of the shed were above) are required to be depressed, for the formation of the next shed, the wires h^*, which form pairs with those wires h, which were raised for the last shed, are acted upon by their card-cylinder through their respective needles, and made to escape contact with the bars of their ascending griff; and thus the wires j, which suspend such warp-threads, together with their respective warp-threads, will be free to fall to their lowest position. It will thus be understood, that the movement of each warp-thread is actuated, as heretofore, by a single wire; but that such wire is capable, by means of the two hooked wires connected with it, of being raised by either of the two griffs. These griffs have alternating motions, or simultaneous motions in contrary directions, given to them, so that the raising and lowering of the various parts of the harness, to form the shed, may go on simultaneously; and the shed may be thus formed with greater expedition than heretofore.

The use of the cross-head k, and the mode in which it acts are thus explained:—The object of the cross-head is to prevent the formation of a double shed; which is calculated (when the pattern is woven on the lower face of the fabric and at a time when but a small number of warp-threads is depressed) to throw too great a beam-strain upon those warp-threads and render them liable to break. By the employment of the cross-head k, these warps are carried up, together with those which are to form the upper part of the shed, and, meeting with the descending threads which were in the upper part of the last shed, are brought down with them, and thus the strain on the warp is properly distributed. On referring to figs. 1, and 2, this action of the cross-head k, will be understood. The arms f, f, (which communicate motion from the shaft c, to the cross-head) have a vertical throw (it will be seen) of half the distance of that of the arms e, and e^*, which actuate the griffs, and thereby, through the wires h, h^*, and j, lift the warp-threads. The middle wires j, when at their lowest position, rest with their heads upon the cross-head. When, therefore, by the rotation of the shaft c, the arms e^*, e^*, are carried up and made to lift the griff g^*, together with the wires that bring up the warps to form the upper part of the shed, the arm f, will raise the cross-head k, and with it all the

wires *j*, *j**, which are not carried up by the griff *g**. By the time that the warp-threads, which the descent of the griff *g*, (caused by the throw of its arms *e*, *e*,) has brought down, assume their lowest position, the throw of the arms *f*, *f*, will have brought down the cross-head *k*, to its former position, and with it the wires *j*, *j**, and their warp-threads which it carried up.

As however there is no objection in ordinary figure weaving to the formation of a double shed, the cross-head *k*, may in some cases be made stationary, as shewn at figs. 6, and 7. These figures shew a mode of constructing the apparatus in a manner somewhat different from that just described. Fig. 6, is a side elevation of the apparatus, and fig. 7, is a sectional elevation of the same, taken in the line Q, Q, of fig. 6. The same letters as those used in describing the former figures refer to corresponding parts in these figures, and therefore no further description will be necessary. In these figures a means is shewn of ensuring that the corresponding portions of the two cards (which, by their alternate action on the two sets of needles, complete the portions of the pattern to which they refer) shall always be presented to the needles in relative succession; so that if the weaver has occasion to put back one card-cylinder, he shall of necessity move the other in a corresponding degree. This is effected by fixing a pulley S, on corresponding ends of the axles of each of the cylinders, suitably formed to receive the links of an endless chain T, and passing this chain in a state of tension over both pulleys. When, therefore, one cylinder is drawn round, a corresponding motion will be communicated to the other. A catch-lever *u*, is jointed to the framing, and is capable of taking into the rounds of the lantern of the card-cylinder. It is connected by a link to the catch-lever *q*, which, in this instance, is extended at *q**, to carry a pendent string *v*. The object of this arrangement is to enable the weaver to throw back the pattern; and this movement he may readily effect by pulling the string *v*, and thereby elevating the catch-lever *u*, which, by coming in contact with a round of the lantern, as the card-cylinder is performing its outward movement, will draw that cylinder round in the reverse direction.

In order to admit of the easy removal of any one of the wires, in case they should require repair, the patentee finds it convenient to provide the hooked wires *h*, *h**, with forks instead of eyes for lifting the central wires; which arrangement gives the weaver a facility of detaching one wire from the apparatus without disturbing the remainder. This modifica-

tion in the construction of the wires *h*, *h**, is shewn upon an enlarged scale at fig. 9, which represents one pair of these wires, with their middle wire *j*. And the mode of constructing the forks is shewn at fig. 10.

In such looms as are furnished with barrels instead of cards, in order to effect figured-pattern weaving, the invention may be applied in a manner similar to that described with respect to Jacquard apparatus. For this purpose, a barrel may be mounted in each of the rocking-frames *m*, *m**, in lieu of the card-cylinders; and the projections upon the barrels, made for producing the pattern, will act upon the horizontal needles in like manner as has already been described. In such cases, one-half of the pattern must of course be marked upon one barrel, and the other half upon the other barrel, in like manner as hereinbefore described with respect to the two sets of cards hereinbefore mentioned; and the catches *q*, *q**, for turning the barrels, must be so placed as to cause each of the barrels, upon every movement of the rocking-frame, on which it is mounted, to turn such part or division of a revolution as may contain a portion of the pattern.

So also in cases where endless bands or chains, having tappets or projections for marking the pattern, are intended to be used—they may be placed upon rollers in the rocking-frames *m*, and *m**, and used in like manner as the barrels already mentioned. And, instead of actuating every thread by means of a separate wire, headles may be used, and attached to the suspending wires in like manner as the stringing of the harness; and this may be useful in cases where the changes in the formation of the shed, necessary for producing a pattern, shall not be numerous.

The patentee claims, Firstly,—the mode of constructing Jacquard and similar apparatus, as aforesaid, with double counterpoised griffs and apparatus for simultaneously raising and lowering different portions of the suspending wires of such apparatus, as aforesaid, in manner hereinbefore described. Secondly,—the mode of applying two barrels, bands, chains, or sets of cards, in manner hereinbefore described, to such Jacquard or similar apparatus, as aforesaid. And, Thirdly,—the mode of constructing and combining hooked and suspending wires of Jacquard or similar apparatus, in manner hereinbefore described, for the purpose of giving motion to the harness or the headles of looms in manner hereinbefore described.—[*Inrolled May*, 1850.]

To Francis Edward Colegrave, *of Brighton, in the county of Sussex, Gent., for improvements in saddles; parts of which improvements are also applicable to the standing rigging and other furniture of ships or vessels, and to the connecting links or chains of railway carriages and other purposes where tension, combined with a certain degree of elasticity, are required.*—[Sealed 29th January, 1850.]

This invention relates, firstly, to improvements in saddles, and consists in the adaptation to certain parts of saddles of a springing or elastic apparatus of a peculiar construction, by the employment of which the horse receives great relief when making any extraordinary exertion, as in leaping, and the girths of the saddle will not be liable to break, as a certain amount of elasticity is given to them; the necessity of tightening the girths, after the rider has been some time in the saddle, will also be obviated; and, on a low-shouldered animal, the elasticity given to the girths has also the effect of preventing the saddle from slipping forward.

In Plate V., fig. 1, represents a side view of a saddle for ordinary hunting or riding purposes,—the spring being in a quiescent or inactive state. The saddle flap is thrown up, in order to shew the spring beneath. Fig. 2, is a transverse sectional view of the same; fig. 3, is a detached view of the spring, drawn upon an enlarged scale; and fig. 4, is an edge view thereof. For steeple-chasing, the arrangement would be similar in construction to that shewn in the abovementioned figures, except that, instead of three sets of springs, only two would be used. Fig. 5, represents a side view of a spring, intended to be applied to racing saddles. In this case only one set of springs is used.

At figs. 1, 3, and 5, the frame, which is made of metal (steel, by preference), is shewn at *a, a, a;* and *b, b, b,* are lugs or eyes on the top or upper side of the frame. Through these lugs holes are bored, to admit the transverse supporting rod *c, c,* one end of which is screwed, for the purpose of taking into a female-screw in the lug *b**. In adapting the spring apparatus to a saddle, this bar or rod *c,* is passed through the eyes of a leather or other strap *p,* which is secured to the saddle-tree in the ordinary manner. The outer end of the bar *c,* has a round and flattened head, for the convenience of holding or turning with the finger and thumb, and screwing or unscrewing the bar, when it it is required to apply or detach the spring apparatus to or from the saddle. Vertical bars *e, e, e,* are secured in pairs in the frame *a, a;* and between

each pair of bars *e*, is another vertical bar *d*, the lower end of which passes through and works in a hole in the bottom bar of the frame *a*;—it being secured to forked pieces *o*, to which the girth-straps are attached. The upper part of the vertical bar *d*, passes through a hole in the short cross-bar or piece *f*, and is furnished with a nut or head *u*, whereby the cross-bar or piece *f*, is drawn down when the spring is in action. The necks of these bars *e*, *e*, and *d*, should be made square, in order to prevent them from turning round when placed in the frame *a*, *a*, and cross-bar *f*. Each of these vertical bars *d*, and *e*, *e*, is enclosed in a coiled spring, as shewn in the drawing. The girths are connected to the straps *p**, *p**, by means of buckles, in the ordinary manner; and when the saddle is secured on a horse, and the girths are tightly buckled, the cross-bar *f*, is drawn down and the coiled springs of the bars *d*, and *e*, compressed, as shewn at fig. 5; but, at the same time, they will yield sufficient to give ease to the horse during any extraordinary exertion, as in leaping. As the girths have a tendency to become looser after the horse has been for some time at work, the springs will come into action, and keep them to a proper degree of tension, without, at any time, interfering with the free action of the horse's lungs, as is now the case when horses are tightly bound with inelastic girths. The apparatus is adapted to the saddle in the same manner that the girth-straps are at present affixed to the tree; and it must be fixed at an angle, and as close as possible, to the point of the saddle-tree, as shewn at fig. 1. Thus it will be seen, that the position of the frame, when fixed to the loop *p*, by means of the supporting-bar *c*, *c*, in figs. 1, and 3, passing through it, will incline forwards at the bottom: this is the proper direction to be taken. In order, also, to prevent either wringing the side of the horse, or the leg of the rider, the panel of the saddle must be cushioned up on either side of the frame (as shewn at *q*, *q*, figs. 1, and 2,) to the thickness and depth thereof. The presence of the frame, which is slightly curved, as shewn at figs. 2, and 4, will then be felt by neither man nor horse, nor will it materially add to the thickness or weight of the saddle. To give the springs fair play, the ordinary sweat-flap, under the frame, is carried down to the bottom of the panel, and a small extra flap *r*, the same size as the outside area of the spring-frame, is placed as a species of bed to the frame, in order that the friction of the springs may not injure the saddle-flaps.

The second part of the invention relates to the construction and employment of an elastic apparatus, similar to that above

described, whereby the standing rigging, and other furniture of ships or vessels, may be made to withstand far more severe trial, use, and wear, than the present unyielding and rigid rigging and furniture will do.

Fig. 6, represents, in side elevation, part of the shrouds of a vessel, with the improvement adapted thereto. The shrouds and blocks of the standing rigging are shewn at *s, s, s.* Two strong square metal horizontal bars *t, t,* are employed; and through these bars strong metal bolts *u, u,* with strong eyes at one end, are passed. These bolts *u, u,* have eyes at one end, whereby they are secured either to the sides of the vessels, when the eyes are at the lower ends, or to blocks above, when the eyes are at the upper ends. The opposite ends of these bolts are furnished with nuts or heads, for the purpose of acting against the horizontal bars. The bolts *u, u,* are furnished with coiled springs, as shewn in the drawings. Thus it will be seen, that these shrouds, which support the mast and other rigging, have a certain amount of elasticity imparted to them; so that when assailed by any sudden gust of wind they will yield in some degree, and afterwards regain their original tension, instead of snapping, as is now sometimes the case. The patentee also applies his elastic connection to anchor cables. At fig. 7, the spring apparatus is shewn. *t, t,* are strong square metal bars, and *u, u, u,* are two strong metal forks, made so that the prongs fit inside one another. At the centre and outer end of each fork is a strong eye, for the purpose of attaching a chain cable to the apparatus. The legs of the forks are surrounded with strong spiral or coiled springs; and they are secured to the bars by nuts *n, n.* The eye of the smaller or inner fork is made fast to the deck, and the eye of the larger or outer fork is attached to the end of the cable. The same instrument may be adapted to any other part of the vessel where it may be considered applicable, and great and sudden resistance or strain is likely to happen.

The last part of the invention relates to the construction and employment of an arrangement of springs, adapted to the connecting links or draw-bars or chains of railway carriages, and other purposes where tension, combined with elasticity, is required. Fig. 8, shews the improvement applied to the frame of a railway carriage. *w, w,* is the frame, divided into three compartments by the cross-beams or bars *v, v;* draw-bars, with hooks at the outer ends, are seen at *x, x,* and are attached, at their inner ends, to two strong metal forks *u, u, u,* similar to those above described for the

cable-stay of a vessel, but of larger dimensions; and *t, t,* are two strong square metal bars, made and bored similar to those mentioned above. The legs or prongs of the forks *u, u,* are enveloped by powerful coiled springs; and the buffer-rods *y, y,* are also made to bear against the bars *t, t,* and thereby act upon the coiled springs between the two bars, Hence it will be seen, that the sudden jerk, which now occurs on the starting of a train, will be received by the bars *t, t,* which will be driven together by the draw-bars being drawn out. It will also be evident, that the buffers do not require other springs for their action than those for the draw-bar, as they equally press against the bars *t, t.*

The patentee claims, First, in relation to saddles,—the employment of a springing elastic or yielding apparatus, such as that herein shewn and described, or any modification thereof, consisting of one or more sets of coiled or spiral springs, arranged and combined in such a manner that, when more than one set is required or is employed, each set may have free and independent action of the others. Secondly,—the application of a spring or elastic apparatus, such as that herein shewn and described, or any mere modification thereof, to the standing rigging and other furniture of ships. Thirdly,—the application of a similar apparatus to the draw-bars or connecting links or chains and buffer-rods of railway carriages, and to any other purposes where tension, combined with a certain degree of elasticity, is required.—[*Inrolled July,* 1850.]

To Robert William Thomson, *of Leicester-square, in the county of Middlesex, civil engineer, for certain improvements in writing and drawing instruments.*—[Sealed 4th July, 1849.]

This invention relates, firstly, to the manufacture of instruments for writing and drawing, to be used in place of pens and similar instruments, and consists in making them of glass, either alone or combined with other materials. The invention consists, secondly, in certain modes of producing elastic holders for ordinary metal pens.

In Plate IV., fig. 1, exhibits, in section, a writing or drawing instrument made entirely of glass. The instrument is made from a glass tube, having a capillary bore of about $\frac{1}{32}$ of an inch; one end of the tube is closed and blown into a bulb of the form shewn, by the method commonly practised by

glass-blowers; and the point *a*, is then heated and drawn into a curved form, suitable for the nib,—the width of which and the opening therein will determine the thickness of the stroke made by the instrument. The patentee does not intend to confine the nib or point of the instrument to the curved form shewn; as it may be straight, or have any other shape or curvature. The nib or point is ground on a stone or small wheel, with emery or diamond dust; or it may be ground and polished by the mode adopted for cutting and polishing small articles of glass and precious stones. The instrument is charged with ink for use, by introducing the point into the ink, and then applying the mouth to the top of the instrument and sucking out the air, when the ink will immediately enter the bulb, from which the air has been withdrawn. On the pressure of the atmosphere being restored, by removing the mouth, it will prevent the ink from rising in the tube; and it is stated that, although the instrument be tossed about or inverted, the ink will not escape.

Instead of using the mouth as a means of exhaustion, an artificial exhausting-piece may be employed, as shewn at fig. 2, where *b*, indicates a short metal tube, provided, at one end, with a ring of India-rubber or other suitable elastic material *c*, which fits air-tight around the tubular stem of the instrument. When it is desired to fill the instrument, the tube *b*, is moved into the position (1,) shewn by dotted lines, and the point *a*, is introduced into the ink; the top of the tube *b*, is then closed air-tight by the thumb, and the tube is drawn upwards into the position (2,) shewn by full lines; whereby a vacuous space is produced at the top of the instrument, into which the air ascends from the bulb, and the latter immediately becomes full of ink. A modification of this exhausting-piece is shewn at fig. 3, consisting of two metal tubes *d*, *e*, which are sufficiently large to slide freely along the stem of the instrument, and are connected together by a tube *f*, of India-rubber or other suitable elastic material: the ends of this elastic tube *f*, are distended, so as to tightly embrace and hold the tubes *d*, *e*; but the centre part of this tube, which is not distended, presses against the stem of the instrument and forms an air-tight joint, in a similar manner to the ring *c*, of fig. 2.

Fig. 4, is a sectional view of a writing or drawing instrument, in which the requisite exhaustion of air, for the purpose of filling the bulb with ink, is effected by means of a piston. The bulb is formed with a short stem, which is fixed

air-tight in the end of a metal tube *g*; in this tube a piston *h*, is fitted air-tight (being rendered so by the application of India-rubber or other elastic substance); and therefore, by raising the piston from its lowest position in the tube *g*, the exhaustion will be effected and the bulb filled with ink. *i*, is an opening in the tube *g*, by means of which the atmospheric pressure is restored.

Fig. 5, is a longitudinal section of a writing or drawing instrument, which may, when charged with ink, be carried about in the pocket: this figure exhibits it in an extended state, ready for use. Fig. 6, is an external view of the instrument, as it appears when packed up ready for the pocket. The short stem of the bulb is fixed in the end of a metal tube *g*, (as at fig. 4,) which contains a piston *h*, and is closed at the upper end by screwing on a cap *j*. *k*, is a metal tube, which fits on to the cap *j*, (as shewn at fig. 5,) when the instrument is in use, and serves to extend it to the proper length; and when the instrument is not in use, the tube *k*, is slidden over the tube *g*, and the instrument then presents the compact appearance represented at fig. 6.

The patentee states that he prefers to make the points or nibs of glass; but they may also be made of precious stones, cut and drilled by the ordinary methods adopted by lapidaries, and then cemented to glass bulbs, as shewn at fig. 7. He also proposes to attach glass or stone nibs to metal tubes or bulbs. To preserve the nibs from being chipped, a small piece of metal tube may be fitted over the nib, and ground to the form of the glass, as represented at fig. 8; or the nib may be preserved by depositing a thin coat of metal by the electrotype process, and grinding it to the shape of the nib.

The methods of giving elasticity to holders for common steel pens, which constitute the second part of this invention, are shewn at figs. 9, and 10. In the holder represented at fig. 9, the pen is held between the outer tube *l*, and a short tubular holder *m*, from the back of which a shank projects, and is inserted into a collar *n*, of vulcanized India-rubber. In the holder exhibited at fig. 10, the pen is held between the tube *l*, and a plug *o*, of vulcanized India-rubber, which is attached to the tube *l*, at its inner end only.

The patentee claims, First,—the making of writing and drawing instruments of glass, shaped or fashioned as before described. Secondly,—the making of glass writing and drawing instruments with nibs or points of any of the precious stones. Thirdly,—the combining, in writing and drawing instruments, of glass and stone nibs with metal bulbs or

reservoirs. Fourthly,—the making of glass writing and drawing instruments with exhausting pistons, as before described. Fifthly,—the elastic holders for ordinary metal pens, as before described.—[*Inrolled January,* 1850.]

To THOMAS RICHARDSON, *of the town and county of Newcastle-upon-Tyne, chemist, for improvements in the manufacture of Epsom and other magnesian salts, also alum and sulphate of ammonia.*—[Sealed 26th January, 1850.]

THE first part of this invention relates to the manufacture of Epsom and other magnesian salts, and consists in employing magnesia, baryta, strontia, or lime, or the sulphuret of potassium, sodium, ammonium, barium, strontium, calcium, or magnesium, for separating the impurities from solutions of sulphate of magnesia; and it also consists in making a double salt of sulphate of magnesia and ammonia. The second part of this invention relates to the manufacture of alum, and consists in certain means of exhausting the aluminous matters from the calcined shale more advantageously than heretofore. The third part of the invention consists in an improved mode of manufacturing sulphate of ammonia.

In carrying out the first part of the invention, the patentee takes a solution of rough Epsoms, or impure solution of sulphate of magnesia, and adds thereto a suitable precipitating agent, which he prefers should be magnesia, brought to the consistence of cream by the addition of water. He stirs the cream of magnesia into the solution, and applies heat by means of steam,—continuing the application until the solution does not change on the addition of sulphuret of ammonium. The solution is allowed to stand until the precipitate has entirely subsided, leaving the solution clear; he then draws off the solution, evaporates to the required strength, and crystallizes. The precipitate may afterwards be washed with water, to remove the soluble sulphate of magnesia. Baryta, strontia, or lime, may be used as the precipitating agent, in place of magnesia, but not with such advantage, because those substances would combine with the sulphuric acid in the solution, and form insoluble compounds. A solution of sulphuret of potassium, sodium, ammonium, barium, strontium, calcium, or magnesium, may be used for precipitating the impurities from the solution of sulphate of magnesia; and, in this case, the operation is to be conducted in the same manner as when the cream of magnesia is employed. Instead of the rough

Epsoms and the precipitating agent being combined in a state of solution, they may be ground together in a moist state, and the pure sulphate of magnesia washed out from the mass. Carbonate of magnesia may be obtained by calcining the magnesia which has been employed as the precipitating agent.

To produce a double salt of sulphate of magnesia and ammonia, the patentee adds gas-water to a solution of sulphate of magnesia, at the same time applying heat, until the solution is rendered nearly neutral; he then allows the precipitate to subside, draws off the clear liquor, concentrates, by boiling, to from 50° to 60° Twaddle, and crystallizes: the salt, thus obtained, may be used in the manufacture of alum, or as a manure. If preferred, the gas-water may be neutralized by sulphuric acid before it is added to the solution of sulphate of magnesia. The double salt of sulphate of magnesia and ammonia may also be obtained by subjecting the sulphate of magnesia, either in solution or in a damp state, to a current of ammoniacal gas, obtained by the distillation of gas-water, guano, or any other matter from which ammonia can be procured by destructive distillation with quick-lime;—the ammoniacal gas being purified, before it is used, by passing it through water

The apparatus employed in carrying out the second part of the invention is represented in Plate V. It consists of a series of pits, numbered 1, 2, 3, 4, 5, 6, which are to be filled with the calcined shale; and into the pit 6, water is to be introduced from the cistern *a*, by opening the cock at the end of the pipe *b*. As soon as the water has extracted the greater part of the aluminous matter from the shale in the pit 6, the valve *c*, is raised from the top of the pipe *d*, and a fresh supply of water being at the same time admitted into the pit 6, the water charged with aluminous matter will pass through the pipe *d*, into the pit 1, and fill the same. When the greater part of the aluminous matter has been extracted from the shale in the pit 1, the valve c^1, of that pit is raised from the top of the pipe d^1, and a further quantity of water is admitted into the pit 6; and thereby the pit 2, is filled with aluminous water from the pit 1. The various pits of the series are successively filled in this manner; and as soon as the aluminous water in any pit has attained a density of 28° Twaddle, it is drawn off by a cock at *e*. When the shale in the pit 6, is exhausted, a fresh supply is substituted; and then the water is first admitted into the pit 5, before it enters the pit 6. As soon as the shale in the pit 5, is exhausted, the pit is recharged with fresh shale, and the pit 4, becomes the first pit of the

series; and thus in succession will each pit become the first of the series.

The third part of the invention consists in manufacturing sulphate of ammonia by subliming the double salt of sulphate of magnesia and ammonia, produced in the manner described under the first head of the invention.

The patentee claims, as his invention, First,—the improvements herein described, in manufacturing Epsom and other magnesian salts. Secondly,—the improvements, herein described, in the manufacture of alum. Thirdly,—the improvements, herein described, in the manufacture of sulphate of ammonia.—[*Inrolled, July,* 1850.]

To Etienne Joseph Hanon Valck, *of the Kingdom of Belgium, miller, for improvements in grinding.*—[Sealed 31st January, 1850.]

This invention consists in causing currents of air to pass between the grinding surfaces of mill-stones by the means represented in Plate IV.

Fig. 1, is a plan view of the upper surface of a mill-stone; fig. 2, is a vertical section; and fig. 3, is an under side view thereof. In the under surface of the stone, channels *a,* are formed for the passage of air to the grinding surfaces when the stone is rotating. Into each channel *a,* two holes or passages *b, c,* which extend through the stone enter: the hole *b,* receives a funnel *d,* shewn detached at fig. 4; and the hole *c,* receives a tube *e,* shewn at fig. 5, which is provided with a cock (fig. 6,), a hooded end (fig. 7,), or else a stopper (fig. 8). If the grain be very dry, all or some of the tubes *e,* are to be closed; but generally it is found desirable to have a free passage through them, and to use the hooded end, fig. 7. The air, as the stone rotates, is caught by the wide end of the funnel, and caused to descend into the hollow channels in the under surface of the stone.

In conclusion, the patentee says, "I would remark that I am aware that funnels have been used as means of causing air to pass between mill-stones. I do not, therefore, claim the same,—the novelty of the invention consisting of having combined therewith channels and openings at their further ends, as explained."—[*Inrolled, July,* 1850.]

To Thomas Berger, *of Hackney, Gent., for improvements in the manufacture of starch.*—[Sealed 26th January, 1850.]

This invention relates to the manufacture of starch from rice.

The patentee commences the operation of starch-making by soaking the rice in solutions of caustic alkali, according to the plan described in the specification of a patent granted to a Mr. Wickham in 1824; but he lays no claim to this part of the process. The rice is soaked successively in three or four solutions of caustic alkali,—soda being employed by preference, and used in the proportion of one hundred and ninety to two hundred and twenty grains to a gallon of water. The manufacture of starch from the rice is conducted as follows:—A ton of rice having been prepared by soaking in three or four caustic alkali solutions (of about three hundred gallons each), it is to be ground by levigators, in cold water, until it is reduced to a pasty or creamy state; and then a pint of spirit or oil of turpentine is to be added, with as much cold water as will make the whole equal in bulk to two thousand gallons. The mixture is stirred for three hours, and then strained through coarse flannel, felt, or sponge,—the refuse remaining on the flannel or other filtering material. Or the mixture may be allowed to stand for half an hour, and the starchy water be then drawn off from above the refuse. The starchy water, obtained in either way, must be strained through fine lawn sieves before it is introduced into the settling vessels. The application of water may be repeated, if thought desirable, to separate further quantities of starch from the refuse. When the starch has settled, it is collected from the settling vessels; and if it is alkaline, it is neutralized with dilute sulphuric acid; and eight ounces of sulphate of zinc are added to each hundred-weight of starch. The starch is now, after being well stirred, to be boxed and finished in the ordinary manner.

The patentee states that he prefers the above process, but that the metallic salts in general, also sulphate of soda (especially if combined with lime-water), turpentine, alum, and a current of electricity, will severally be found effectual in place of the turpentine and sulphate of zinc. He does not, therefore, confine himself to the above process, nor to the quantities of the agents employed, nor to any particular combination of them. When electricity is employed, the electric currents should be passed through the rice when ground with water, and through the starch previous to being boxed;—the

starch being stirred all the time that the electricity is passing through it. The application of the electricity is continued for about two hours on each occasion; and the patentee uses for this purpose a Smee's battery of six cells, about five inches by seven inches, for the production of 5 cwts. of starch.

Another part of the invention consists in introducing the starch and alkaline solution into a barrel or vessel, which is made to perform one revolution per minute, and which, it is stated, has been found very efficacious in extracting the gluten out of the rice. The patentee says, that he prefers a barrel five feet in diameter and five feet long, which will contain a ton of rice and three hundred gallons of alkaline solution; and he has found it advantageous to allow each solution to remain on the rice for three hours while the barrel is kept rotating. He does not confine himself to the use of a barrel, as a vessel of another form will answer; or, in place of causing the vessel to revolve, a like effect may be produced by causing a stirrer to revolve while the vessel remains stationary; but it is preferred that the vessel should revolve.

The patentee claims, Firstly,—the manufacturing of starch from rice by using turpentine and sulphate of zinc, as described; and also straining the starchy waters and boxing the starch in those stages. Secondly,—the use of metallic salts, also sulphate of soda, turpentine, alum, and electricity, whether separately or in combination, in the manufacture of starch. Thirdly,—the use of flannel, felt, or sponge, as a medium for separating the refuse matters from starch. Fourthly,—the application of mechanical stirring or the rotation of the vessel containing rice when being steeped in a solution of caustic alkali or other solution used when making starch from rice.—[*Inrolled July*, 1850.]

To Robert Barbor, *of Chatham-place, Lock's Fields, in the county of Surrey, metal smelter, for certain improvements in artificial fuel and in machinery used for manufacturing the same.**—[Sealed 17th January, 1850.]

The first part of this invention consists in a method of preparing artificial fuel for kindling or lighting fires by combining tan-bark (commonly known as tan) with resin-oil.

* As this patent bears date the 17th of January, the specification was due the 17th of July, being one day prior to the date of inrolment: the patent is therefore void until confirmed by order of the Privy Council.

The tan or bark is first subjected to a bruising or crushing process, in order to separate the fibrous and other particles of which it is composed and to facilitate the moulding and manufacturing of the same into fuel: this the patentee prefers to effect by moistening the tan with water or other liquid, and causing it to be trodden down by the feet of a horse until it is brought to the required consistence. When the tan has been reduced to a pulpy or plastic state, it is formed into blocks or cakes, which are allowed to dry gradually in the open air until the particles become sufficiently hard and porous to absorb a suitable quantity of resin-oil. The blocks or cakes, when dry, are placed in an open-work basket or wire frame and immersed in the resin-oil (which should be kept in a highly heated state) until they are thoroughly saturated; then the unabsorbed resin-oil is allowed to drain; and, after the blocks or cakes have been dried by exposure to the air, they are fit for use.

The second part of the invention consists in manufacturing artificial fuel by combining common tan and resin together in a dry and unprepared state. The tan and resin are put into a suitable vessel and heated, by steam or otherwise, until the resin is melted; then the tan and resin are well stirred until they are completely amalgamated; after which the combined materials are taken out in a warm state and placed in moulds; and, when cold, the blocks or cakes are ready to be used as fuel.

The third part of this invention relates to machinery for moulding and compressing artificial fuel, and consists in coating the outer and inner surfaces of the dies or moulds with enamel, in order to prevent the adherence of viscous substances to the sides of the dies or moulds, which has heretofore been productive of great inconvenience.

The patentee claims, Firstly,—the treatment of common tan and resin-oil as above described, when employed for the purposes of artificial fuel. Secondly,—the manufacture of the said fuel from common tan and resin in an unprepared state, as described under the second head of the invention. Thirdly,—improvements in machinery which consist in the employment of enamel dies or moulds for manufacturing artificial fuel into blocks or cakes, as aforesaid.—[*Inrolled July*, 1850.]

To JAMES MC DONALD, *of the City of Chester, coachmaker, for certain improvements in the mode of applying oil or grease to wheels and axles, and to machinery; and in connecting the springs of wheel-carriages with the axles or axle-boxes.*—[Sealed 11th January, 1850.]

THIS invention consists, firstly, in an arrangement of parts for supplying oil to the journals of the axles of railway carriages and waggons; and, secondly, in a method of connecting the springs and axle-boxes of railway carriages and waggons, so that the springs and carriages may have a small amount of motion independent of the axle-boxes, without straining the springs or axles.

In Plate IV., fig. 1, is a longitudinal section, and fig. 2, an end view of an axle-box constructed according to this invention. *a*, is the arm of the axle; *b*, is the boss or nave of the wheel; and *c*, is the axle-box. *d*, is a curved bearing-piece, of brass or other metallic alloy, which rests upon the arm *a*, of the axle; and it has two conical openings d^1, d^1, in it, through which oil is introduced between the under surface of the piece *d*, and the axle-arm. *e*, is an air-tight oil-vessel, furnished with two projecting pieces or nipples, situated directly over the conical openings d^1, d^1, and having a hole formed through each; in which hole, a wick, consisting of from 250 to 300 cotton yarns, is inserted; and through these wicks the oil slowly descends, and drops from the lower end thereof into the openings d^1, d^1. The oil-vessel *e*, is provided with a cover *f*, which is not removed, when it is desired to introduce oil into the vessel, but simply raised; and the cover, on being released, is returned to its seat, and retained thereon, by the action of a helical spring *g*, which is coiled around the stem of the cover, between the cross bar *h*, (through which the stem works) and a nut *i*, on the lower end of the stem. The surplus oil, which has been used for lubricating the axle-arm, descends to the lower part of the axle-box; and it is drawn off, from time to time, by unscrewing the stud or plug *j*. To prevent dirt from getting between the bearing-piece *d*, and the axle-arm, a prolongation of the piece *d*, extends to the boss of the wheel, and is formed with a semicircular rib d^2, which bears upon the part a^1, of the axle. There are likewise two other semicircular or nearly semicircular ribs *k*, *k*, affixed to the lower part of the axle-box, and bearing against the part a^1; and the spaces *l*, *l*, formed by these ribs, are filled with tow or other soft packing material.

The improved method of connecting the springs and axle-

boxes of railway carriages and waggons is also shewn at figs. 1, and 2. *m*, is a metal bar, attached to the axle-box, and having, in its upper surface, a hemispherical cavity, designed to receive the lower half of a ball or sphere *n*; and *o*, is another metal bar, connected with the spring *p*, by the braces *q*, *q*, and having a similar recess in it, to receive the upper half of the ball *n*: thus the spring is connected with the axle-box by a kind of ball-and-socket joint.

The patentee claims, First,—an air-tight oil-box, applied and adapted for supplying oil to the journals of railway carriages and waggons, as the same is required, by means of a wick, whether in combination or not with the arrangements above described for keeping out the dust and collecting the surplus oil, as above described. Secondly,—the constructing and connecting the springs and axle-boxes of railway carriages and waggons in such manner as that the springs and carriages may have a small amount of motion independent of the axle-boxes, without straining the springs or axles.—[*Inrolled July*, 1850.]

To JOSEPH PARADIS, *of Lyons, in the Republic of France, merchant, for an invention of improvements in the manufacture of elastic mattresses, cushions, and paddings; part of which improvements are applicable to other purposes where sudden or continuous pressure is required to be sustained or transmitted,—being a communication.*—[Sealed 3rd December, 1849.]

THIS invention of improvements in the manufacture of elastic mattresses, cushions, and paddings, consists in the employment of a spring of peculiar construction for imparting to such articles the requisite degree of elasticity, and at the same time rendering them lighter than when stuffed in the ordinary manner. The springs which have hitherto been used in the construction of mattresses are of that description commonly known as the "hour-glass" spring, from its peculiar form; but if great care is not taken in constructing and mounting them, or if pressure is applied to them otherwise than in a vertical line, they are found to get quickly out of order. The improved construction of spring, intended to be employed for the several purposes hereinbefore mentioned, possesses the advantages of simplicity and cheapness of construction, and of not being liable to derangement from ordinary use.

In Plate V., a single spring, of the improved construction, is shewn in front and side views at figs. 1, and 2; and several

of them are shewn as applied to a spring-mattress, seat, or cushion, at figs. 3, and 4;—the former of which figures represents a longitudinal section, and the latter a plan view of a mattress, shewing the manner of arranging and securing the springs. The spring (as will be seen at figs. 1, and 2,) consists of a single piece of iron wire *a, a*; the ends of which are inserted into opposite ends of a central hole made in a cylindrical wooden or metal roller *b*, round which the central part of the wire is coiled or wound to form a helical or coiled spring. In this roller the ends of the wire are not fixed, but are allowed a proper amount of play. When pressure is applied to either or both ends of the spring, the ends will be forced to approach each other, and the coiled part of the spring will be forced outwards, as indicated by dotted lines, and will thereby be caused to unwind in both directions; during which operation a great amount of resistance will be offered by the elasticity of the spring. In applying these springs to mattresses, couches, cushions, and such like articles, it will be found advisable to arrange the springs in pairs; that is, in such a manner, that two single springs which constitute the pair, may, when pressed upon, act or bend out in opposite directions. These springs may either be placed opposite to each other or arranged alternately, as shewn in the drawings. All the springs *a, a,* are (as shewn at figs. 3, and 4,) secured at their lower ends to cross pieces *c, c,* which are fixed to the wooden side framing *d, d,* of the mattress, cushion, or other article; and at their upper ends the springs are secured to the flexible longitudinal straps *e, e,* which are fastened at each end to the end pieces of the framing, as shewn in the drawing. These longitudinal straps are connected transversely by rods or bars *f, f,* made of cane or other strong material, for the purpose of binding the several parts together, and causing all the springs to act together.

The improved springs may also be applied to buffers, and likewise as suspension or carriage springs for railway carriages. At figs. 5, and 6, the mode of combining a number of the springs to form a buffer-spring for railway carriages is shewn. Fig. 5, represents a partial longitudinal section of a buffer-spring, constructed with the improved springs; and fig. 6, is a transverse section or end view of the same, with the head-plate removed, to shew more clearly the mode of arranging the springs. In order to give a considerable amount of elasticity to the buffer two sets of springs are used,—one set being placed behind the other in a separate compartment. The buffer, as shewn in the drawing, is constructed of two

sets of springs, having six springs to each set; and the head of the buffer being circular, the springs are arranged in the form of a hexagon. To give steadiness and uniformity to the action of the springs, their pressure is received and communicated by a central rod *g*. The springs in both compartments are protected from dirt and accidental injury by a leather or other flexible covering *k*, *k*. Figs. 7, and 8, shew two methods of applying this improved spring to the suspension of railroad carriages. A pair of springs, of sufficient power, may be taken, and either placed between the horns of a railroad carriage and immediately above the axle-box, as at A, fig. 7, or secured in a flexible box or chamber, as at B, fig. 8, between the frame to which the running wheels are connected and the frame which carries the body of the carriage. In the former case, fig. 7, the coiled part of the springs, when collapsed, is forced outwards in a line with the axles of the wheels; whereas, in the arrangement shewn at B, fig. 8, the springs are arranged and act more in the manner that the buffer-spring (shewn in figs. 5, and 6,) would act. The springs, in this instance, are enclosed in a metal box or case, over which another box or case works, as shewn in the drawing, and therefore prevents any dirt or extraneous substances from getting into the springs and deranging them; while, at the same time, the springs have plenty of room allowed them for expansion and compression.

In some cases, it is proposed to arrange a row of springs along a transverse bar, somewhat in the manner in which the springs are arranged for a mattress, couch, or other similar article, as shewn at figs. 3, and 4. When suspension-springs are made in this manner, the transverse bar extends across from side to side of the carriage; and the upper ends of the springs are secured to a corresponding transverse bar, fixed to the under side of the carriage. Fig. 9, shews a plan of adapting these improved springs to a two-wheeled carriage, such as a gig or tilbury, in place of the ordinary flat or elliptical springs. The body of the carriage is suspended in front from short standards *i*, by joints or shackles; and the back part of the body is connected, by means of scroll-irons on each side, to two pairs of springs, made of sufficient strength to resist or support the weight to which they will be subjected. The patentee prefers to employ two pairs of springs, one pair on each side of the carriage; but, if it be thought more advisable, a row of springs, similar to those shewn in figs. 3, and 4, but of suitable strength, may be placed under or at the back of the body of the carriage, in place of the two pairs

of springs shewn in the drawing. It will be evident that these springs may, without difficulty, be applied to four-wheeled as well as two-wheeled carriages.

At fig. 10, one of these improved springs is shewn as adapted to the treadle of a lathe, for the purpose of assisting in raising the treadle after it has been depressed by the foot of the workman.

From the above description, it will be understood that the improved spring may be applied to a variety of other purposes where an elastic pressure is required.

The patentee claims the peculiar form or construction of metallic spring shewn at figs. 1, and 2, or any mere modification thereof; and the employment of such spring, either singly or in sets, for the several purposes to which it or they may be applicable.—[*Inrolled June,* 1850.]

To George Robarts, *of Tavistock, in the county of Devon, Gent., for certain improvements in clogs and pattens.*—[Sealed 19th June, 1850.]

This invention consists in certain improvements in the construction of clogs and pattens, whereby the wearer is enabled to put them on the feet and take them off again without stooping or using the hands for that purpose.

In Plate VI., fig. 1, is a side view and fig. 2, a plan view of a clog constructed according to this invention; fig. 3, exhibits the hind part of the clog, with the heel-piece thrown back; fig. 4, shews the heel-piece detached; and fig. 5, is a plan view, fig. 6, an under side view, and fig. 7, an edge view of the box or case containing the bolt or catch, by which the heel-piece is held in its proper position when the clog is upon the foot. The clog is made with a moveable heel-piece *a*, attached to a metal lever *b*, which turns upon pivots at *c*, so as to admit of the heel-piece falling back into the position shewn at fig. 3. *d*, is a bolt or catch, which turns upon a pin at one end in the case *e*, and is constantly pressed towards the hindmost edge of the case by the spring *f*. This catch, when the lever *b*, moves into a horizontal position, is pressed back by the lever until the notch b^1, in the front end of the lever comes opposite the catch; and then the catch moves into the notch and holds the lever securely until it is released by drawing back the catch, which is effected by pressing against the knob or button *g*, on the end thereof. In order to put this clog on the foot, the heel-piece is permitted to fall

back into the position shewn at fig. 3, by pressing against the knob *g*, with the opposite foot; the toe of the shoe or boot is then inserted into the toe-piece *h*, of the clog; and, on the heel of the shoe or boot descending, it will move the lever *b*, into a horizontal position, and thus bring the heel-piece *a*, to its proper position at the back of the shoe or boot (as shewn at fig. 1,), in which it will be retained by the catch entering the notch of the lever *b*. When it is desired to remove the clog from the foot, the end of the lever *b*, is released by pressing the knob *g*, against the other foot; and then the heel-piece falls back, and the foot can be withdrawn from the clog. It will be evident that the strap *i*, which passes over the instep, will not require to be fastened and unfastened every time that the clog is put on or taken off, as usual; and, after having been once adjusted, it need not be touched.

Fig. 8, is a plan view and fig. 9, a side view of a patten, in which a more simple arrangement is employed for effecting the above object. Along the centre of the patten is formed a groove, to receive a metal bar *j*, (shewn detached at fig. 10,) which is retained therein by the two pieces of metal *k*, *k*; but it is permitted to slide backward from the toe of the patten to a distance determined by the length of the recesses j^1, j^1, in the bar *j*; for, as the pieces *k*, *k*, are let into the body of the patten and descend into the recesses j^1, j^1, the motion of the bar will be stopped when the shoulders or ends of the recesses come in contact with the pieces *k*, *k*. At the front end of the bar *j*, there is a projecting piece j^2, against which the toe of the shoe presses; and at the hind end there is a curved piece j^3, to embrace the heel. In the under side of the bar *j*, there is a notch j^4, into which, when the bar is in the position shewn at figs. 1, and 2, the spring-catch *l*, enters, and holds the bar securely until it is released by pressing on the knob *m*, and thus causing the spring-catch *l*, to descend and quit the notch j^4. When it is desired to put on the patten, the bar *j*, is drawn out as far as the pieces *k*, *k*, will permit; the foot is then placed between the pieces j^2, and j^3, and pushed forward until the further progress of the bar is stopped by the pieces *k*, *k*; and then the catch *l*, slips into the notch j^4, and secures the bar *j*. The bar *j*, is released, for the purpose of removing the patten from the foot, by pressing down the knob *m*, with the other foot.

The patentee claims, as his invention, the making and constructing of clogs and pattens, with the improvements aforesaid applied thereto and embodied therein.—[*Inrolled August*, 1850.]

To John Grantham, *of Liverpool, engineer, for improvements in sheathing ships and vessels.*—[Sealed 4th July, 1849.]

This invention consists, firstly, in so applying copper or other metal sheathing to iron ships or vessels, that such metal sheathing shall be affixed to a sheathing or coating of material which is not a conductor of electricity, interposed between the iron surface of the ship and the metal sheathing; secondly, in applying external ribs or projections to iron ships, in order to fix wood or other sheathing thereto; and, lastly, in an apparatus for employing hot blast for heating the bottoms of iron ships, in order to facilitate the sheathing of the same.

In Plate VI., fig. 1, is an external elevation of part of the side of an iron ship, exhibiting the mode of applying the first and second parts of this invention thereto; fig. 2, is a horizontal section of the same; and fig. 3, is a vertical section thereof. The patentee states, that the first object which he has in view in sheathing iron ships with non-conducting material (such as wood, gutta-percha, or compounds of gutta-percha) is to obtain the means of affixing metal sheathing thereon, in such a manner that there shall not be any conductive communication between the iron surface of the vessel and the metal sheathing; but such sheathing of non-conducting material, when applied by the aid of external ribs or projections, will be advantageous without reference to the further sheathing with metal. When building iron vessels, the external ribs or projections *a*, are to be so applied as to cover the vertical joints of the sheets or plates of iron *b*, and then angle-iron or other bars *c*, are to be applied on the inside; but when sheathing iron vessels already built, only the external ribs *a*, are to be applied. Ribs of the section shewn at *a*, are preferred; because, when the iron plates are rivetted thereto, there will be dove-tail recesses between the ribs, into which pieces of wood *d*, are to be forced;—care being taken to first paint or coat the surface of the iron plates *b*, and, if possible, to leave no space between the pieces *d*, and the surface of the iron plates, in order to prevent the iron from being injured by rust. Wood sheathing *e*, is fixed to the pieces *c*; and it is important that, if metal fastenings be used for that purpose, they should not pass through *c*, and *d*, so as to come in contact with the iron plates *b*; and the fastenings used for the copper or other metal sheathing should not be long enough to pass through the wood sheathing *e*.

In this manner may metal sheathing be applied without there being any conductive communication between it and the iron surface of the ship. The joints of the parts *d, e,* are to be carefully caulked in the ordinary way, so as not to leave any spaces or passages for the water to enter. Although the patentee prefers that the external ribs should be of the section shewn, he does not confine himself thereto; and it is not essential that they should in all cases be made of iron, nor that they should be fixed in the direction shewn, so long as suitable ribs or projections are employed to aid in fixing sheathing to iron vessels. And, with regard to the first part of the invention, it is not essential that the outside ribs or projections should be used, so long as wood, gutta-percha, compounds of gutta-percha, or other non-conducting sheathing or coating be employed, and fixed by cementing or melting, or in such manner that the metal fastenings for fixing the metal sheathing will not pass through or come in metallic communication with the iron of which the vessel is constructed.

Fig. 4, is a plan view, and fig. 5, a vertical section of an apparatus or machine, constructed according to the third part of this invention, for warming and drying the sides of a vessel, while performing any of the operations for coating them with any adhesive material. *a,* is a double cylinder of sheet-iron, provided with a fire-place *b,* for burning coke, and a chimney *c.* At the front end of the machine there is a rotary fan *d,* which, when put in motion by means of the handles *e, e,* drives air into the outer case of the cylinder *a;* from thence it passes out through the pipe *f,* which is connected by a moveable joint *g,* with a series of jointed pipes; and by these pipes the heated air is conveyed to any part of the vessel's sides that may be desired. *h,* is a pipe, which leads from the chimney into the pipe *f;* and both this pipe and the chimney are provided with throttle-valves *i, i,* so that either can be used at pleasure. When the machine is required to be used, a fire is made in the fire-place *b;* and the rotary fan being set in motion, a stream of hot air is forced through the pipes against the side of the vessel. This stream of hot air will dry and warm the surface of the vessel, in readiness to receive a coating, and will aid in keeping the materials in a melted state. As soon as the fire has burnt clear, the throttle-valve in the chimney may be closed, and that in the pipe *h,* opened; and thereby the hot air from the furnace will be permitted to mix with the air heated in the outer case of the cylinder *a,* and thus assist the operation of drying.

The machine is mounted upon wheels, so that it can be readily moved about from place to place.

The patentee claims, First,—the applying copper or other metal sheathing to iron ships or vessels, by interposing sheathing or coating of a material not a conductor of electricity. Secondly,—the applying external ribs or projections to ships or vessels, for the purpose of facilitating the affixing of wood or other sheathing. Thirdly,—the arrangement or combination of mechanical parts into a machine for applying hot blast to the sides of a ship or vessel, to facilitate the application of sheathing.—[*Inrolled January,* 1850.]

To JOHN SCOFFERN, *of Essex-street, in the county of Middlesex, M. B., for improvements in the manufacture and refining of sugar; and in the treatment and use of matters obtained in such manufacture; and in the construction of valves used in such and other manufactures.*—[Sealed 21st February, 1850.]

THIS invention consists, firstly, in an improved mode of employing the sub-acetates of lead in the manufacture and refining of sugar, for the purpose of defecating saccharine solutions (being an improvement upon the process patented by the present patentee, December 8th, 1847*); secondly, in employing sulphite of lead as a pigment; and, thirdly, in an improved construction of valve, to be applied to the pumps used for forcing the sulphurous acid gas into saccharine solutions which have been previously treated with sub-acetates of lead, and to pumps employed for similar purposes.

The improved mode of employing sub-acetates of lead for defecating saccharine solutions is as follows:—The juice having been put into a suitable vessel of copper or iron, heat (by preference, steam heat) is applied thereto until the temperature is raised to 210° Fahr.,—all the impurities being skimmed off as they rise to the surface. The juice is then boiled until its density (tested by Beaumé's saccharometer) has increased one degree above that previously indicated when the juice was at the same temperature. The source of heat is then removed; and when the temperature of the juice has sunk just below the boiling point, the sub-acetate of lead is brought to the consistence of paste by the addition of water, and thoroughly

* For description of this invention see Vol. XXXIII., p. 196, Lond. Jour.

mixed with the juice by stirring. The patentee states that the proportion of salt of lead which he has found to answer is about one-sixth per cent. of the juice.

The second part of the invention consists in using sulphite of lead in the manufacture of a white pigment. When sulphurous acid gas is introduced into saccharine solutions which have been treated with sub-acetates of lead, it combines with the lead and forms sulphite of lead, which precipitates. The patentee states, that the sulphite of lead may be used with advantage as a paint, instead of white-lead;—it "covers" well, and does not blacken when exposed to hydrosulphuric acid. It is to be prepared and used in the same manner as white-lead. This part of the invention is not confined to the use of sulphite of lead obtained in the manner just described; as sulphite of lead, produced in any other way, may be employed.

The last part of the invention consists in a valve, to be applied to the pumps used for forcing sulphurous acid gas into saccharine solutions, and to other purposes where valves are required to act only in one direction, in order to permit the discharge of a fluid and prevent its return. The valve is shewn in Plate VI.; it consists of a cylinder or tube *a*, closed at one end, and having a screw thread formed on the other, by means of which it is connected with the nozzle of the pump or with a pipe proceeding therefrom. There are several holes *b*, *b*, in the tube for the exit of the gas or other fluid; and these are covered by a tube *c*, of vulcanized India-rubber, which will yield to pressure from within, and permit the fluid to escape (as indicated by the arrows), but will effectually prevent its return.

The patentee claims, First,—the improvement, herein described, in the manufacture and refining of sugar. Secondly,—the manufacture of a pigment by the employment of sulphite of lead. Thirdly,—the construction of valve herein described.—[*Inrolled August*, 1850.]

To Thomas Lightfoot, *of Broad Oak, within Accrington, in the county of Lancaster, chemist, for improvements in printing and dyeing fabrics of cotton and of other fibrous materials.*—[Sealed 3rd January, 1850.]

This invention consists, firstly, in the employment of archil or cudbear in printing fabrics composed wholly or partly of cotton, linen, or other vegetable fibre, when such fabrics have

been first prepared according to some of the means hereafter explained; and, secondly, the invention consists in employing the coloring matters of archil or cudbear in combination with a previous preparation of the vegetable fibrous matters, as hereafter explained, when producing dyed fabrics composed wholly or partly of cotton, linen, or other vegetable fibre.

The patentee prepares such fabrics with a basis of oils or fats; and for this purpose he prefers the preparation for the Turkey-red process; but variations may be resorted to, so long as the preparation is with a basis of oils or fats. The fabric, when composed of cotton, or linen, or other vegetable fibre, is first partially bleached, by boiling it for six or seven hours in water, with 2 oz. of crystallized carbonate of soda (common soda crystals of commerce) to each pound of the fabric; it is then washed in clean water, and steeped in a mixture of sulphuric acid and water, at one degree on Twaddle's hydrometer, for about one hour; the fabric is then again washed, and the previous operation is repeated; the fabric is next dried in the ordinary manner; and it will then be ready for the oil process. The fabric is now charged with the following mixture:—For each pound weight of fabric half an ounce of pearlash is dissolved in one and a quarter pints of water, at 100° Fahr., and 2½ oz. of olive oil are added thereto and thoroughly mixed. The fabric is immersed in this mixture till it is absorbed; or the fabric is padded in this mixture, in the usual way, by a padding machine, and allowed to rest two or three hours; it is then stoved, the heat being gradually raised during five or six hours, to 140° Fahr.; and having remained there all night, it will be ready to pass through the second operation. This operation, together with the third, is merely a repetition of the one just described.

The fourth operation is described as follows:—The fabric is impregnated with one and a quarter pints of water to each pound of fabric, at 110° Fahr., and allowed to rest two or three hours; when it is again stoved, as stated in the first operation. The 5th, 6th, 7th, 8th, 9th, 10th, 11th, and 12th operations are merely repetitions of the 4th. After the 12th operation, the fabric is steeped for a day and a night in a solution of pearlash, mixed in the proportion of 1½ oz. of pearlash to four pints of water for each pound of fabric;—such solution being at a temperature of 110° Fahr. at the time the fabric is immersed. The fabric is then wrung out or squeezed,—well washed two or three times in clean water, and dried in the stove. The fabric is next padded with acetate of alumina, commonly called red liquor; and the mor-

dant, thus applied, is fixed by hot water in a manner well understood. In cases where only archil or cudbear colors are intended to be used, the patentee pads with aluminate of potash or soda, which does not require the fabric to be treated with hot water before printing; when, however, a scarlet is required to be obtained, the aluminous mordants are not used. The fabric, thus prepared by the Turkey-red process, is now in a fit state to receive the archil or cudbear coloring matter.

The patentee remarks, that he does not confine himself to the above mode of preparing, by the use of oils or fats; nor does he make any claim to the Turkey-red process of preparation, the same being well known; neither does he claim the process of preparing fabrics by oils or fats when uncombined with the subsequent use of archil or cudbear colors.

Another mode of preparing a fabric of cotton, or linen, or other vegetable fibre, when about to print it with archil or cudbear, is by using earthy or metallic bases. For this purpose, salts, either of magnesia, lead, copper, tin, zinc, bismuth, cobalt, or nickel, are employed, by impregnating the fabric with a saturated solution, in water, of any of these salts. The fabric, so impregnated, is dried, and then passed through a weak solution of potash, or soda, or ammonia: by preference, carbonate of soda is employed, in the proportion of 1 lb. of soda to one gallon of water. The fabric, so prepared, washed, and dried, may be now printed with archil or cudbear. The patentee remarks, that the fabric, so prepared by any of the above-mentioned salts, will fix the archil or cudbear color; but each salt produces a different tint of color.

Another mode of preparing fabrics of cotton, or linen, or other vegetable fibre, is with alkalies, or alkaline solutions of earths, or alkaline solutions of metallic oxides. For this purpose, the patentee employs aluminated potash, aluminated soda, or a solution of oxide of lead in lime, or potash, or soda; or a solution of oxide of tin in potash or soda; or a solution of oxide of arsenic in potash or soda; or a solution of either of the fixed alkalies (potash or soda) alone: any of these solutions will fix the coloring matter of archil or cudbear; but different tints will be produced; and although saturated solutions produce the fullest effect, yet solutions which are not saturated produce weaker shades or tints of the same color, which, in some cases, are desired. The fabric is to be impregnated with any of these solutions, either by padding or other means; and, when dried, the fabric is ready to be printed with coloring matter of archil or cudbear.

When alkaline solutions or metallic oxides are used to prepare cotton, linen, or other vegetable fibre to be printed upon, this treatment is effected before they are manufactured into a fabric with animal fibres; but when the Turkey-red process of preparation is used, it may be applied either before or after the vegetable fibres are combined in fabrics with animal fibres. The following is the mode of preparing archil or cudbear:—Take archil, or a preparation of cudbear, or a lake prepared from them, and mix it (by preference) with gum senegal, dissolved in water, or with other substances used by printers for thickening colors; and when such coloring matters have been printed on such fabrics in the manner usually adopted by printers, they are steamed in a vessel for a period of 45 minutes, more or less, to fix them,—depending on the other steam colors used on the same fibres; the coloring matters of archil or cudbear requiring less time than most other steam colors—after which, the fabrics are washed. In order to brighten the colors, treat the printed fabrics by passing them through a weak solution of aluminated potash, or aluminated soda; but other matters may be used, such as lime-water, or a solution of potash or soda, or arseniate of soda or potash, or stannate of soda or potash, or silicate of soda or potash, or other alkali or alkaline earth: such solutions should be about one degree on Twaddle's hydrometer; and after their application the fabrics should be washed. In cases where the fabrics have other colors printed upon them (in addition to the archil colors), which would be injured by passing through such alkaline solutions, then, in place of passing such fabrics into the solution, the alkaline solutions are thickened (the aluminates of potash or soda being preferred), and printed on to the parts where archil or cudbear colors have been printed. A like result is obtained by combining magnesia with archil or cudbear colors before printing therewith. For this purpose, the patentee adds at the rate of about 24 oz. of recently-prepared hydrated carbonate of magnesia, or 12 oz. of caustic or calcined magnesia (using more or less, according to the hue desired) to each gallon of the color; and this combination of magnesia is also beneficial when printing fabrics of silk or wool.

The object of the second part of the invention (which consists in dyeing with the coloring matters of archil or cudbear, cotton, linen, or other vegetable fibrous matters, previously prepared with oils, or fats, or other matters) is to give to the vegetable fibres an oil, or fat, or other preparation, which will have the property of fixing the coloring matters of archil or cudbear. For this purpose, the patentee has found the

Turkey-red preparation, as in the case of printing above described, to be the best for the purpose, particularly when vegetable fibres are used with animal fibres; and, further, the alkaline preparations are difficult to be employed when dyeing, by reason of their being liable to be washed off in the process of dyeing; but the process of preparation may be varied. The archil or cudbear colors employed are prepared as if about to dye wool or silk therewith; and the process of dyeing is performed in the manner heretofore resorted to when dyeing wool or silk, with this difference,—that in the dye-liquor aluminated soda is employed, in the proportion of 2 oz. thereof, at 24° Twaddle's hydrometer, to 1 lb. of cudbear, of ordinary strength; or, in place thereof, aluminated potash, or lime-water, or arsenite of potash or soda, or stannate of potash or soda, or silicates of potash or soda, or other alkali or alkaline earth of equivalent strength.

The patentee claims, Firstly,—the printing of archil and cudbear coloring matters on fabrics composed wholly or partly of cotton, linen, or other vegetable fibre, when such fabrics have been first prepared as hereinbefore explained; and also the use of magnesia mixed with archil or cudbear colors for printing on fabrics therewith. And, Secondly,—the use of archil or cudbear coloring matters in dyeing the prepared fibres of fabrics composed wholly or partly of cotton, linen, or other vegetable matters.—[*Inrolled July,* 1850.]

To BRERETON TODD, *of the Bank, Falmouth, Gent., for improvements in the manufacture of arsenic, sulphuric acid, and the oxide of antimony, from copper and other ores in which they are contained, and also the oxide of zinc.*—[Sealed 27th February, 1850.]

THIS invention consists principally in submitting uncalcined or unroasted copper and other ores to the action of a blast furnace, connected with suitable flues and chambers for condensing the volatile products; and in making the spare heat of the said blast furnace available, in a calciner or furnace, for subliming arsenic, sulphur, and other volatile substances, from the ores. These improvements are carried out as follows:—The blast furnace having been charged with fuel, and heated to the required temperature (enough fuel being introduced to fill the furnace to a sufficient height above the tuyere), a charge of ore, in its raw state, either with or without flux, according to the nature of the ore, is to be put on the top of

the fuel, and the charging aperture immediately closed and luted [the fuel and ore are, doubtless, arranged in several alternate layers; although it is not so stated; but, at this part of his specification, the patentee makes the following remark—"Much depends on the power of the blast used, and if a reverberatory furnace is attached to the blast furnace in the process,—as to the number of alternate layers of fuel and ore to be introduced at one time of charging"]. When the charge sinks below a certain depth, it is to be replenished in the same manner. If a calcining or roasting furnace is attached to and heated by the blast furnace, a charge of ore is to be introduced into it during the time of charging the blast furnace; and it can be stirred at the time of putting in the succeeding charges. When the charge is sufficiently roasted, it may be either drawn out or pushed towards the blast furnace to be fused; and a fresh charge may be introduced.

In order to manufacture arsenic, the patentee takes copper and other arsenical ores, and submits them, without previous calcination or roasting, to the action of a blast furnace, as above described. The arsenic is volatilized, and the non-volatile metals, in the state of regulus, fall into the lower part of the furnace with the scoria, from which they separate by difference of gravity, and are tapped off at different levels. The patentee also puts a charge of the same sort of ore into the calciner or furnace through which the vapours and gases from the blast furnace pass. The volatilized arsenic is carried off with the gases arising from combustion, and passes into the flues and chambers, where it is condensed in the state of oxide; and it is then removed and purified by sublimation: any copper or zinc that may have been volatilized will be found in the refuse.

To manufacture sulphuric acid, the patentee takes sulphate of copper, or sulphate of iron, and, without any previous calcination or roasting, submits the same to the process above described for arsenical ores. The volatilized sulphur is carried off with the gases arising from combustion, and passes through the flues into the chambers in the state of sulphurous gas; it is then converted into sulphuric acid by being brought into contact with steam and oxygen, as commonly practised.

To obtain oxide of antimony, the patentee takes ores mingled with antimony, and subjects them, without previous calcination or roasting, to the same process as the arsenical ores. The antimony is volatilized, and passes off with the products of combustion into the flues and chambers, where it is condensed in the state of oxide of antimony; and this is purified

by subliming it in a reverberatory furnace, and condensing the fumes in flues or chambers. If the ores contain sulphuret of lead, it will be volatilized, and the principal portion thereof will be found deposited in the flue nearest the furnace; and that portion which is mingled with the oxide of antimony, previous to sublimation, will be left in the reverberatory furnace in the state of oxide of lead. Instead of the above process, the ores containing antimony may be subjected to a process of calcination in a reverberatory furnace, and the volatilized antimony condensed, in the state of oxide, in the flues and chambers;—the sulphur which the ores contain being, at the same time, allowed to fly off in the state of sulphurous gas.

To manufacture oxide of zinc, copper and other ores containing zinc are subjected, without any previous calcination, to the same process as the arsenical ores, and the volatilized zinc is condensed in the chambers in the state of oxide. The principal part of the sulphur, with which the zinc was mineralized, is driven off in the state of sulphurous gas; but it may be converted into sulphuric acid, as above described, and condensed with the oxide of zinc, so as to form sulphate of zinc. The oxide of zinc is to be deprived of any arsenic or sulphur that may have been condensed with it, by calcination or roasting in a reverberatory furnace or retort; and the arsenic or sulphur may be condensed. If the ores contain sulphuret of lead, it will be volatilized with the oxide of zinc, and be found principally in the flue nearest the furnace; but, if any sulphuret of lead is mixed with the oxide of zinc, the latter is to be calcined until the sulphuret of lead is converted into oxide; and then it may be separated therefrom either by washing (as, owing to the greater specific gravity of the oxide of lead, it sinks before the oxide of zinc), or by reducing the oxide of lead at a heat which will not be sufficient to reduce the oxide of zinc; or the mingled oxides may be employed as glaze or glitter;—the sublimed sulphuret of lead may likewise be used for the same purpose.

The patentee claims the invention of submitting copper and other ores, for the purposes above described, without any previous roasting or calcination, to the action of a blast furnace in connection with flues and chambers of sufficient size to condense the volatile products, and, by the same process, obtaining the metallic substances that do not volatilize in the state of regulus. Also employing the spare heat of the said blast furnace, in a calciner or furnace attached to the same, for subliming arsenic, sulphur, and other volatile substances, from the above-named ores. Also the manufacture of arsenic,

sulphuric acid, oxide of antimony, oxide of zinc, and sulphate of zinc, as above described. Also the subliming of the sulphuret of lead from the above ores, and the condensing of the same, and the separating of it from the oxide of zinc, as above described.—[*Inrolled August,* 1850.]

To WILLIAM MAYO, *of the firm of Mayo and Warmington, Silver-street, Wood-street, Cheapside, manufacturers of mineral and aerated waters, for improvements in connecting tubes and pipes and other surfaces of glass and earthenware, and in connecting other matters with glass and earthenware.*—[Sealed 21st February, 1850.]

THIS invention consists in forming connections or joints on glass and earthenware tubes or pipes, and connecting such tubes or pipes and other surfaces of glass and earthenware with other matters, by casting metal thereon.

The form of joint which the patentee prefers is produced by casting metal flanges on the ends of the glass and earthenware tubes, and then connecting the flanged ends by means of screw-couplings; but the form of the joint may be varied, so long as the same is produced by casting metal on to glass and earthenware tubes.

In Plate VI., fig. 1, represents the end of a tube *a,* with a flange *b,* cast thereon; and fig. 2, exhibits the ends of two tubes, connected together by a screw-coupling *c,* which is shewn in section. Fig. 3, is a plan view and fig. 4, a sectional elevation of the mould used for casting metal flanges on the tubes. The mould consists principally of two parts d, d^1, which are jointed at *e,* and are brought together or moved apart by means of the handles *f, f.* The tube *a,* is retained in a vertical position in the mould, while the flange *b,* is being cast thereon, by means of a collar *g,* which also serves to close the upper part of the mould. *h,* is a conical plug, which is screwed into the bottom plate *i,* and closes the lower part of the mould. The patentee states that he believes pure tin to be the best metal for making such metallic connections; and he pours such metal, when melted, through the "get" or opening *j,* into the lower part of the mould, up which the metal rises, driving the air before it. The glass or earthenware tube is warmed before putting it into the mould. When connecting the tubes together, a small quantity of bees'-wax should be applied at the joint.

The tubular necks or other tubular parts of glass or earthenware bottles or other vessels may have castings made thereon

suitable for connections for fixing tubes thereto and covers thereon; and in like manner may other surfaces of glass and earthenware be connected with other matters by casting metal thereon. The patentee says that he does not claim generally the casting of metal on to earthenware vessels; as he is aware that metal cocks, for drawing off aerated liquids, have long been made and fixed by casting them on to earthenware bottles: his invention consists in obtaining means of connecting tubes or other surfaces of glass and earthenware to each other and to tubes and other surfaces of other materials.

The patentee does not confine himself to the above details, so long as suitable castings of metal are made on pipes or tubes of glass or earthenware. What he claims is, the forming of connections or joints on glass and earthenware tubes and pipes, and connecting such tubes and pipes and other surfaces of glass or earthenware with other matters, by making castings of metal on glass and earthenware tubes and pipes, and on other surfaces of glass and earthenware.—[*Inrolled August,* 1850.]

To THOMAS WHIFFEN, *of Pig's Quay, Bridewell Precinct, accountant, for improvements in machinery for registering the delivery of goods.*—[Sealed 21st February, 1850.]

THE patentee commences his specification by stating that gas is the only thing in common use, the delivery of which is registered by itself. Various attempts have been lately made to register the delivery of liquids by mechanical contrivances; but machinery has not been used for counting or registering the delivery of dry goods. The articles of commerce of which there is the largest consumption are coals and corn; and these being always delivered for sale in the same quantities, great facility is thus afforded for registering the delivery thereof. Coals are weighed from the ship in quantities of two hundred-weight and a half, or one-eighth of a ton; and they are weighed from the barges in quantities of two hundred-weight, or one-tenth of a ton. Corn is delivered in sacks, each containing four bushels,

The apparatus which the patentee proposes to employ for registering the delivery of coals from a ship consists of a metal box, containing a train of toothed wheels and ratchet-wheel and click or driver; the click or driver is connected to a weighted lever, by which it is actuated and caused to transmit motion through the ratchet-wheel to the train of toothed wheels; and upon the front of the box there are three or more dials, with the spindle of one of the toothed wheels pro-

jecting through the centre of each, and carrying a hand or index, which points out, upon the dial, the motions of the wheelwork. The first dial is divided into eight parts, each representing the eighth of a ton; and the second, third, and succeeding dials are divided into ten parts. The indications of the dials may thus be read off in parts of a ton, tons, tens of tons, &c. The coals are weighed from the ship in a box or "vat," suspended from one end of the scale-beam; and the registering apparatus is to be fixed to the side of the box or vat, in such manner that the act of opening the door or flap of the box, to discharge the coals, will permit the weighted lever to descend and actuate the wheelwork: the act of closing the door will cause the lever to return to its original position.

In the apparatus for registering the delivery of coal from barges, the first dial is divided into ten parts, each representing the tenth part of a ton. The apparatus is actuated by a board or iron plate (instead of a weighted lever), suspended vertically over a spot where the coal-porters must pass, and at such a height, that the sack of coals, which each man carries, will raise the board or plate into a horizontal position, and thus give motion to the registering apparatus. Or the apparatus may be worked by means of a horizontal bar, which will be pushed back by the breast of each man coming in contact therewith, and will be returned to its original position by a spring. Or the apparatus may be actuated by connecting it with a plank, up which the coal-porters must walk, and which is to be supported in such manner that it will yield or sink to a determined depth when the weight of the man and the sack of coals is upon it, and will be returned to its proper position by a spring. The delivery of sacks of corn may be registered in the same way as the delivery of sacks of coals.

The delivery of other kinds of dry goods may be registered by similar apparatus to that above described.—[*Inrolled August,* 1850.]

To ROBERT OXLAND, *of Plymouth, chemist, and* JOHN OXLAND, *of the same place, chemist, for improvements in the manufacture of sugar.*—[Sealed 26th April, 1849.]

THIS invention consists in the use of acetate of alumina for defecating cane and beet-root juice, and for defecating and removing the color from the solutions of raw sugar produced in the process of refining sugar.

The operation of refining sugar according to this invention is conducted as follows:—The raw sugar may be blown up in the usual manner; but the patentees prefer to dissolve it

in water with the aid of heat from steam passing through a flat coil of pipe into a jacket surrounding the pan; then carbonate of lime, in fine powder, is added to the syrup until all acidity is neutralized; and the solution is made to boil at a temperature of 220° Fahr. After this, the syrup is run into the ordinary filter-bags; and when it runs bright from them it is introduced into another blow-up pan, shallower than the first, but fitted in the same manner. Acetate of alumina is now mixed with the syrup; and the whole is boiled at a temperature of 220° until the greater part of the acetic acid has been evolved: this may be ascertained by testing the steam, which passes off from the syrup, with blue litmus paper. If desired, the acetic acid may be collected, by the use of a steam-tight cover, connected by a pipe with a condensing apparatus. When nearly all the acetic acid has been evolved, a solution of tannin in water is stirred into the syrup, in small quantities at a time, until no further precipitate is produced thereby; carbonate of lime, in fine powder, is then added in sufficient quantity to neutralize all acidity; after which, the syrup is passed through bag-filters; and as soon as it runs bright from the filters, it is introduced into the reservoir that supplies the vacuum-pan. The boiling in the vacuum-pan and the whole of the subsequent operations are conducted in the ordinary manner.

The patentees state that one filtration through the bags will be found sufficient, provided a larger quantity of acetate of alumina be used, and the liquor be caused to pass through a fine copper sieve as it runs from the blow-up pan into the filters. In the preparation of fine liquor, to be used subsequently to the "claying" operation, it is desirable to employ a small quantity of acetate of alumina; heating the syrup, to which it has been added, to 212° Fahr. for a few minutes; then adding a sufficient quantity of the solution of tannin to precipitate the last traces of alumina, and enough carbonate of lime to neutralize all acidity; and, lastly, passing the syrup through filter-bags.

Cane-juice and beet-root juice are treated with the acetate of alumina and solution of tannin for defecation, either before the neutralization by lime and concentration by heat, or subsequently, when the juice has been concentrated to from 20° to 28° Beaumé.

The acetate of alumina is prepared in the following manner: —Sulphate of alumina is dissolved in cold water, and a clear solution of soda-ash, also prepared with cold water, is added thereto, until an alkaline reaction is produced on reddened litmus paper. The liquor is allowed to stand until the alumina

is precipitated; then the clear liquor is drawn off, and the precipitate washed with a fresh quantity of water; this water is drawn off as before; and the washing is repeated until the hydrometer no longer indicates the presence of any soluble matter. Acetic acid is now added to the precipitate in successive quantities, until the whole or nearly the whole of the alumina is dissolved,—care being taken not to add an excess of acid. The patentees do not claim this mode of preparing acetate of alumina, nor do they confine themselves thereto, as acetate of alumina, prepared by other methods, may be used for the purposes of this invention. They prepare the solution of tannin by digesting one pound of crushed valonia in two gallons of hot water,—using the clear liquor.

It is stated that, as different sugars differ in their qualities, an exact rule as to the quantity of acetate of alumina to be used cannot be given; but the operator can readily ascertain the quantity required in each case, by taking a sample of the juice or sugar and testing it with a measured quantity of acetate of alumina. The best effect has been found to be produced on a fair sample of Jamaica sugar by employing at the rate of four pounds of alumina, dissolved in acetic acid, for each ton of sugar.

The patentees claim the employment of acetate of alumina for defecating saccharine liquors, and for the removal of color in making and refining sugar.—[*Inrolled October,* 1849.]

Scientific Notices.

THE PROVISIONAL REGISTRATION ACT.

In our last number we called attention to two government Bills which were passing through Parliament, and were intended, the one to effect a slight reform in the granting of patents, and the other to provide for the provisional registration of designs and inventions; we have now to announce, that the former, which was entitled "a Bill, to simplify the forms and appointments to certain offices, and the manner of passing grants under the Great Seal," has been abandoned; while the latter, after undergoing some important alterations, has passed into a law, under the title of "An Act to extend and amend the Acts relating to the Copyright of Designs." The loss of the appointment to offices bill calls for little remark, as, at best, the bill displayed but a feeble attempt at grappling with a subject that requires to be dealt with in a comprehensive and careful manner;—we must not, however,

dismiss so hastily the Copyright of Designs Amendment Act. So early as the time when the scheme for the great industrial exhibition first assumed a tangible shape, we remember to have heard it bruited that, for securing to the proprietors of such new and useful machines as would be exhibited at the "world's fair" a property in their own inventions, an Act of Parliament would be required, which should, on the one hand, prevent the piratically inclined from surreptitiously obtaining possession of whatever might be deemed valuable in the exhibition; and, on the other, should nullify the effect which the premature exposure of inventions, intended ultimately to form the subjects for letters patent, would have upon the validity of the grants. With the view, then, of meeting these difficulties, the Copyright of Designs Bill was framed, which provided, that inventions, and also designs capable of being registered under the Acts of 1842-3, should be provisionally registered, and thereby secured to their respective proprietors for the term of one year, with the option of patenting or registering (according to the nature of the case) in the ordinary way before the expiring of this term;—but that the making, using, or vending, would destroy the right of protection granted by the provisional registration. This bill, however, after it had passed the Lords, and been twice read in the Commons, was found to be open to insuperable objections,—as, by it, in in its then form, the greatest inconvenience, not to say injustice, would be imposed on inventors desirous of patenting their improvements; it was therefore determined to narrow the scope of the Act, by confining provisional registration to designs only, and thereby to make it at least harmless, even at the expense of its becoming altogether inoperative. The very desirable objects therefore which provisional registration was intended to effect are still unattained, and that for the very simple reason that, under the present inefficient system of patent law, they are impossible of attainment. That this failure to give to exhibitors of new and useful machines a temporary protection against fraudful speculators in their ingenuity will act detrimentally to the exhibition of 1851, by making foreigners, as well as British subjects, chary of publishing their most valuable discoveries, we think there can be little doubt; but we shall be well satisfied if (as there is some reason to hope) from the discussion which the subject provoked, should result the amelioration of our patent laws, which at present cripple while they encourage ingenuity, and hold out hopes which none but the rich have the power of realizing. As we gave the Copyright Amendment Bill *in*

extenso in our last number, we think it unnecessary to lay before the reader more of the Act than refers to provisional registration; as the other clauses, which go to effect some unimportant extensions of the former Designs Acts, stand with scarcely any alteration, as set forth in the bill. The following are the amended clauses referring to provisional registration:—

"Whereas it is expedient to extend and amend the Acts relating to the Copyright of Designs: be it therefore enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present parliament assembled, and by the authority of the same:

"I. That the Registrar of Designs, upon application by or on behalf of the proprietor of any design not previously published within the United Kingdom of Great Britain and Ireland or elsewhere, and which may be registered under the Designs Act, 1842, or under the Designs Act, 1843, for the provisional registration of such design under this Act, and upon being furnished with such copy, drawing, print, or description, in writing or in print, as in the judgment of the said Registrar shall be sufficient to identify the particular design in respect of which such registration is desired, and the name of the person claiming to be proprietor, together with his place of abode or business, or other place of address, or the style or title of the firm under which he may be trading, shall register such design in such manner and form as shall from time to time be prescribed or approved by the Board of Trade; and any design so registered shall be deemed 'provisionally registered,' and the registration thereof shall continue in force for the term of one year from the time of the same being registered as aforesaid; and the said Registrar shall certify, under his hand and seal of office, in such form as the said Board shall direct or approve, that the design has been provisionally registered, the date of such registration, and the name of the registered proprietor, together with his place of abode or business, or other place of address.

"II. That the proprietor of any design which shall have been provisionally registered shall, during the continuance of such registration, have the sole right and property in such design; and the penalties and provisions of the said Designs Act, 1842, for preventing the piracy of designs, shall extend to the acts, matters, and things next hereinafter enumerated, as fully as if those penalties and provisions had been re-enacted in this Act, and expressly extended to such acts, matters, and things respectively; that is to say:

"1. To the application of any provisionally registered design, or any fraudulent imitation thereof, to any article of manufacture or to any substance.

"2. To the publication, sale, or exposure for sale, of any article of manufacture or any substance to which any provisionally registered design shall have been applied.

"III. That during the continuance of such provisional registration, neither such registration nor the exhibition or exposure of any design provisionally registered, or of any article to which any such design may have been or be intended to be applied, in any place, whether public or private, in which articles are not sold or exposed or exhibited for sale, and to which the public are not admitted gratuitously, or in any place which shall have been previously certified by the Board of Trade to be a place of public exhibition within the meaning of this Act, nor the publication of any account or description of any provisionally registered design exhibited or exposed or intended to be exhibited or exposed in any such place of exhibition or exposure in any catalogue, paper, newspaper, periodical, or otherwise, shall prevent the proprietor thereof from registering any such design under the said Designs Acts at any time during the continuance of the provisional registration, in the same manner and as fully and effectually as if no such registration, exhibition, exposure, or publication had been made; provided that every article to which any such design shall be applied, and which shall be exhibited or exposed by or with the licence or consent of the proprietor of such design, shall have thereon or attached thereto the words 'provisionally registered,' with the date of registration.

"IV. That if, during the continuance of such provisional registration, the proprietor of any design provisionally registered shall sell, expose, or offer for sale, any article, substance, or thing to which any such design has been applied, such provisional registration shall be deemed to have been null and void immediately before any such sale, offer, or exposure shall have been first made; but nothing herein contained shall be construed to hinder or prevent such proprietor from selling or transferring the right and property in any such design.

"V. That the Board of Trade may, by order in writing with respect to any particular class of designs, or any particular design, extend the period for which any design may be provisionally registered under this Act, for such term not exceeding the additional term of six months as to the said Board may seem fit; and whenever any such order shall be made, the same shall be registered in the office for the registration of designs; and during the extended term the protection and benefits conferred by this Act, in case of provisional registration, shall continue as fully as if the original term of one year had not expired."

As respects the benefits which this Act is likely to confer on the public we would remark, that we cannot conceive a case in which the provisional registration of designs would be of the slightest service; but, should any instance of its applicability present itself, we would admonish the intending registree to pause and consider before he deposits his design in the secret archives of the registration office, as he will be thereby prohibited for twelve months from making, using,

and vending his improved manufacture; while, by obtaining a fancied security against piracy, he may be induced to act less cautiously than heretofore; and thus put it in the power of any individual who may have inspected the design "in any place which shall have been certified by the Board of Trade to be a public exhibition," to vitiate his right to a subsequent beneficial registration, by making the design public in other ways than those which the Act indemnifies. True it is, that any party so acting will render himself liable to a fine of not less than £5 or more than £30; but it is possible that an envious man might not be deterred from destroying a rival's right to a valuable monopoly by the fear of being mulct in a sum equal to the highest penalty allowed by law: indeed, the throwing open of a valuable improvement to the public at such a cost might be considered a profitable investment. To have removed the liability of the proprietor of a provisional registration being thus defrauded of his right, it should have been provided, that the acts of infringers should not disturb the validity of a beneficial registration subsequently obtained for the same design; or else that the registrar should have the power (under certain circumstances) of ante-dating registrations, so as to make the legal right of working bear a prior date to that of the fraudulent publication of the design. It does not appear that any orders have yet been issued, by the Board of Trade, respecting either the forms to be gone through in registering under this new Act, or the fees to be paid thereon; but they will, doubtless, be forthcoming before much public inconvenience is experienced by the delay.

ON THE CLEANSING OF METAL CASTINGS.

[Translated for the London Journal of Arts and Sciences.]

In the old process of cleansing metal castings from the coating of oxide and sand with which they are covered when taken from the mould, the work is thrown into water acidulated with sulphuric or hydrochloric acid, which acts upon the surface of the metal, and more or less completely removes the covering of foreign matter. The acid, however, leaves the surface rough and unequal, and it is generally necessary, after its action, to have recourse to mechanical means to effectually take away the oxide. Some time since, M. Sorel had remarked, that the cleansing of castings was more completely effected by the acidulated water produced in certain processes employed in the depuration of oils, and left as refuse, than by a mere mixture of acid and water; and, according to the experiments of MM. Thomas and Delisse, the oxide and sand are removed from cast surfaces with great certainty and facility, if, to the water acidulated with sulphuric acid, organic

matter, such as glycerine, artificial tannin, naphthaline, creosote, or stearine, be added. The acid liquor, thus prepared, does not dissolve the coating of oxide, but causes it to become detached and scale off without sensibly attacking the surface of the metal beneath; there is no disengagement of hydrogen gas, as when common dilute acid is employed, even when the immersion of the metal in the bath is continued for a very considerable time; and the surface, after the operation, is uniform, quite clean, and smooth.

In practice, it is found that, by the employment of the mixture described, 60 per cent. of acid is saved, and not one-half as much metal lost as in the old process. The new method is also peculiarly applicable to the cleansing of works in zinc and brass. It may be remarked, in passing, that, if the mixture of water, acid, and organic matter be employed as the exciting fluid in a cell of Bunsen's galvanic battery, the consumption of the zinc will be diminished to one-eighth the ordinary quantity, without in anywise enfeebling the energy of the electric current.

The substances mentioned above as being employed, in addition to the acid liquor, in the experiments of MM. Thomas and Delisse, being somewhat difficult to procure under some circumstances, particularly by persons engaged in ordinary industrial occupations, M. Elsner entered upon a series of trials, in order to ascertain whether or not certain organic matters, of a cheaper class, and more easily procurable, could not be substituted for those already tried with so much success. With this object, both wood and coal-tar were mixed with the dilute acid. As these substances contain creosote, and other products of the destructive distillation of organic bodies, the useful effect of which had been proved by the previous experimenters, it was believed that they would advantageously replace the rarer and more expensive materials first tried. The mixture of tar and dilute acid was, in fact, found to answer perfectly well the objects of the experiment: a piece of casting, in iron, was immersed in the mixture;—the metal was completely cleansed of the coating of oxide without any disengagement of hydrogen gas; and the surface was of a clear greyish-black color, quite clean, and smooth, and totally unattacked by the acid. A similar piece of casting, immersed in the kind of acid solution ordinarily used in this process, was almost wholly dissolved in an equal time.

The practical value of this process seems to be so considerable as to render it worthy of being generally known and tested by more extended trials.—[*Technologiste.*]

ON THE VALUATION OF POTASH OF COMMERCE.

BY M. MOHR.

The crude potash of commerce varies extremely as to the actual quantity of alkali which it contains; generally it consists, in great

measure, of certain soluble and insoluble foreign matters; the former being chiefly sulphate of potash, silicate of potash, and chloride of potassium; and the latter, carbonate of lime, ashes, the debris of the furnace, &c. Some kinds of potash are completely exempt from insoluble matter,—the potash of Illyria, for example, which is sufficiently pure to be employed for pharmaceutical and other comparatively delicate purposes. American potash contains a great deal of caustic alkali, as well as a little sulphuret of potassium. The German potash abounds in sulphate of potash, while that of Illyria contains 85 per cent. of carbonate of potash. The Illyrian potash has a bright white appearance; that of America is greenish, which color it owes to the presence of manganate of potash. As carbonate of potash is a very deliquescent substance, it communicates that property to commercial potash. The best kind of the latter accordingly readily deliquesces in the air; at first it becomes moist and pasty, and is afterwards rendered quite fluid. Impure potash becomes merely moist. Although the deliquescence of potash is an indication of its good quality, the buyer should be on his guard against purchasing it in a wet state, unless he wishes to pay for water instead of alkali. Many different methods have been employed to determine the richness of commercial potash in the alkaline carbonate; the most direct plan, and that which seems least subject to fallacy, consists in determining the loss of carbonic acid when the carbonate is decomposed by a stronger acid. In this plan of analysis of course it is necessary that no carbonate besides that of potash be present, and that the potash itself be in the form of the simple carbonate, and not as caustic potash, nor as the bi or sesqui-carbonate. It will also be necessary to have regard to the quantity of water present; for, although the water must cause a real loss of alkali in a given weight of the compound, it cannot be regarded as a sophistication. The estimation of the water is easily effected by igniting a given quantity of the substance in a platinum crucible, and determining the loss after calcination. In this experiment another object will be answered,—viz.: all the potash which existed in the caustic state, or as sulphuret of potassium, will be brought into the state of carbonate. In order to completely accomplish this end, the weighed potash must be moistened, without removal from the crucible, with a concentrated solution of carbonate of ammonia. The mixture must then be evaporated to dryness, and calcined at a low red heat. The weight of the residue gives the quantity of fixed matter, with which is of course contained the potash, under the form of simple carbonate. When the commercial potash is entirely soluble in water, the estimation of the weight of the dissipated carbonic acid may be at once proceeded with: but if it should not be quite soluble, as much as possible should be dissolved in water, and the solution filtered,—the filter being carefully washed with distilled water. If there be no apparatus at hand suitable to the estimation of the carbonic acid, the following simple contrivance

will be found sufficient to the purpose:—into a deep drinking-glass, provided with a plate of glass for a cover, introduce a known weight of the calcined potash; pour upon it double its weight of distilled water, and place the glass, with its contents and cover, in the pan of a good balance. Obtain also a small thin stoppered bottle, containing a sufficient quantity of sulphuric or nitric acid to saturate the whole of the alkali in the drinking-glass; place this in the pan with the latter, and accurately counterpoise the whole. Next pour the acid drop by drop into the alkali in the glass, stirring and leaving it to rest for some time, covered with the glass plate. Great care must be taken to add the acid so gradually that the fluid does not become heated, otherwise there may be a loss, in consequence of the escape of watery vapor. When it is found, by the discontinuance of effervescence upon stirring, and the addition of a further portion of acid, that the decomposition of the carbonate is complete, the cover must be taken off, and the glass moved about in the air, to remove the atmosphere of carbonic acid from its interior. It must then be replaced in the pan of the balance, and the loss of weight carefully ascertained: this indicates the quantity of carbonic acid originally present. Pure carbonate of potash contains in 100 parts, exactly 31·8 of carbonic acid and 68·2 of potash. 100 grains of carbonate of potash, chemically pure, could therefore only lose 31·8 grains of carbonic acid;—but an impure salt would of course lose so much the less, as it contained less of the carbonate.

As soon as the loss of carbonic acid in a given weight of the potash is ascertained, it is easy to calculate the quantity of pure carbonate which it contains. If 31·8 of carbonic acid corresponds to 100 of carbonate of potash, the quantity of the acid found will correspond with a certain simple proportional of the carbonate. It is only necessary thus to multiply the loss in acid by 100, and divide the product by 31·8; that is to say, $31{\cdot}8 : 100 :: m : x$, m representing the loss of carbonic acid. It should be remarked that in this process there exist two sources of error; fortunately, however, these are of such a nature that they compensate for each other: the carbonic acid removes with it a certain amount of aqueous matter, which causes a very demonstrable loss of weight; but at the same time a certain portion of the carbonic acid itself is left in solution in the fluid, and cannot be disengaged by stirring, without access of temperature; and the weight gained by the presence of the acid is just about sufficient to stand against that of the loss from escape of water.

The first source of error may be avoided by effecting the decomposition of the carbonate in a small matrass, at the mouth of which a tube containing fragments of chloride of calcium is placed to absorb the aqueous vapor. The second cause is obviated by heating the matrass to expel the carbonic acid, which is then entirely removed from the fluid. But for an ordinary

alkalimetrical experiment, the method described above is sufficiently exact.

A different and older method of estimating the quantity of carbonate of potash in commercial potash consists in determining the quantity of acid of a certain known strength which it requires to saturate a given weight of the potash. This method is, however, subject to many important objections;—it depends greatly upon judgment. The point of saturation is only known by the effect produced upon test paper (litmus). Now, as the reddening of the blue paper takes place gradually, and the color passes through many shades, the exact point of saturation is rendered vague and uncertain. The application of the acid requires great practice; because, by the least excess, the process is at once rendered nugatory. The carbonic acid also produces a reddening of the test paper, and it requires considerable tact to distinguish between the tint produced by the test acid and that by the liberated carbonic acid. Moreover, the preparation of the test acid itself is very difficult, and requires a long series of experiments by the very means which are subject to the sources of fallacy just pointed out.—[*Ibid.*]

ON DEFINITE COMBINATIONS OF IODINE AND PHOSPHORUS.

BY M. B. CORENWINDER.

Little has yet been ascertained of the combinations of iodine and phosphorus, as they have not yet been obtained in a definite state, and in the form of crystals. There is, nevertheless, a process by which these results may be obtained. It consists in successively dissolving the phosphorus and iodine in sulphuret of carbon, and allowing the liquid to cool. Crystals of iodide of phosphorus will soon be deposited, the composition of which will depend on the quantities employed. Thus, by operating upon two equivalents of iodine and one of phosphorus, large prismatic crystals, of an orange-red color, will be obtained, the composition of which, on analysis, appears to be I^2Ph: this is the proto-iodide of phosphorus. This compound melts at about 110 degrees, and volatilizes at a higher temperature;—it is affected by exposure to the air; and may be advantageously employed for the preparation of hydro-iodic acid.

By taking three equivalents of iodine for one of phosphorus, and making a concentrated solution, crystals are speedily produced, of a somewhat irregular form, of a fine deep red color, and presenting the appearance of hexagonal sheets. In this instance, the cooling must be effected by means of a mixture of ice and marine salt. These crystals, on being deprived, by distillation, of all traces of sulphuret of carbon, give a mass, susceptible of crystallization, by fusion, in the form of long prisms. This is the deuto-iodide of phosphorus: it melts at about 55 degrees, is decomposed by water, and will furnish hydro-iodic acid on being heated in the presence of a small quantity of water.

By operating upon quantities in the proportion of one equivalent of phosphorus to one of iodine, crystals of the proto-iodide will be obtained, and an excess of phosphorus will remain in the mother liquor.

With five equivalents of iodine and two of phosphorus, proto-iodide is first crystallized, and, finally, deuto-iodide, which justifies the following equation :—

$$5I + 2Ph = I^2Ph + I^3Ph.$$

With four and even five equivalents of iodine and one of phosphorus, iodine is first deposited, and, afterwards, crystals of the deuto-iodide (I^3Ph).

By the employment of sulphuret of carbon as a solvent, several other compounds, such as chloride of phosphorus, sulphuret of phosphorus, &c., were obtained in the form of crystals by M. Corenwinder.—[*Ibid.*]

ON GALVANIC SOLDERING.

BY M. LE DOCTEUR L. ELSNER.

Under the name of galvanic soldering a process is known, by means of which two pieces of metal may be united, by means of another metal, which is precipitated thereon through the agency of a galvanic current. This mode of soldering by the "wet method" has been often recommended in various periodicals relating to the industrial arts; but it has been objected that,—practically speaking,—the union between two pieces of metal could not be effected by means of a metal precipitated by galvanic agency. In order, however, to arrive at a definite conclusion upon this question, M. Elsner undertook the following experiments, the results of which are in favor of the practical use of the operation of soldering by galvanic agency.

In conducting these experiments, the kind of battery known as Daniell's "constant battery" was employed; and upon the end of the copper wire, which formed the negative electrode, a strong ring of sheet-copper was placed. This ring was cut asunder at one point, and the distance left between the severed parts was about one-half or one-third of a millimetre. At the end of a few days (during which time the exciting liquors were several times renewed) the space in the severed portion of the ring was completely filled up with copper regulus, which had been precipitated; and on partially cutting, with a file, through the part thus filled up, and examining it with a lens, it was observed to be very equally filled with solid and coherent copper.

Another copper ring was then cut into two parts, and the two semi-annular segments, thus obtained, were placed with the faces of the sections opposite each other, and submitted to the action of a galvanic current. At the end of a few days the segments were united by the copper precipitated, thus forming again a complete ring. It was also found in this case, on removing with a file a portion of the thickness of the ring at the points of

contact, that the spaces had been completely filled up by copper galvanically precipitated, which had united the whole. On observing these points carefully with a lens, the regular deposition of the copper could be readily traced between the formerly separated portions of the ring.

A third experiment was made in the following manner:—Two strong rings of sheet-copper were laid with their freshly-cut faces one upon another, so that the two rings constituted a cylinder. These rings were surrounded by a band of sheet-tin, which was coated with a solution of wax, so that the two rings were equally surrounded by a conducting material. Thus disposed, these rings were attached to the negative wire of the battery, and immersed in the bath of sulphate of copper. At the end of a few days, the interior surface of the rings was covered with precipitated copper, and between the contact surfaces of the two rings copper was also precipitated. These rings had only been submitted to the galvanic current to such an extent as to cover their interior surface with a thin coating of precipitated copper, and yet they were already completely re-united, and formed a cylinder consisting of a single piece. The exterior conducting covering consisting of a sheet of tin, was, of course, removed, before testing the cohesion or persistance of the galvanic precipitate. It may be remarked, that these rings, after being for a certain time in contact (during the galvanic action), together with the plate of copper upon which they rested, became so incrusted with precipitated metallic copper, that some force was found necessary to effect their detachment from the copper wire.

There would appear to be no doubt then, according to the results obtained in the preceding experiments, that two pieces of metal may be firmly united by means of galvanically-precipitated copper;—in a word, that soldering by galvanic agency is perfectly practicable. It will therefore be possible to firmly unite the different parts of a large piece of metal, and to make a perfect figure of them by galvanic precipitation of a metal (copper in ordinary cases). If solutions of salts of gold or silver were employed in as concentrated a form as those of copper above mentioned, there is reason to believe that galvanic soldering would also result. In fact, M. de Hackewitz states, that in some experiments on a larger scale, which he undertook, to obtain hollow figures by galvano-plastic means, he had remarked that galvanic union often took place between the pieces operated upon.

M. Elsner states, that while conducting the experiments above mentioned, he remarked that, by employing too powerful a current, the negative electrodes of copper, and even the plate of copper, and ring of the same metal resting thereon, became covered with a deep brown substance, in the same manner as this occurs under similar circumstances in galvanic gilding, as is well known. After several unsuccessful attempts to prevent the formation of this brown coating, M. Elsner found that it was possible to remove it entirely on immersing the articles covered

therewith, during a few seconds, in a mixture of sulphuric and nitric acids. By this means the precipitated copper was made to assume its natural red color.

The possibility of practically effecting the operation of soldering by galvanic agency may be explained in a few words, in a theoretical point of view. The article is, in fact, in an electro-negative state of excitation, whilst the zinc operates positively;—the result is, that the faces which are placed opposite each other, when the ring has been cut, are negative; that is to say, in an electric condition of the same denomination. During the progress of the electrolytic decomposition of the metallic salt in solution (sulphate of copper in the above case), the electro-positive molecules of copper which are detached, simultaneously arrange themselves upon the two opposite faces, and in the direction of the break. Now from the moment that these molecules are deposited, they constitute, with the piece, a homogeneous mass; and from that time act negatively upon the copper which is contained in the solution, and again precipitate copper in the form of regulus. This method of operation continues until the space which existed between the two separate pieces of metal is filled up with metallic copper; in fact, the layers of copper which become deposited in an equal manner upon the contiguous faces of the metal, gradually diminish the distance which separated the latter, until at length the metallic layers which cross in the opposite direction, meet each other;—the result being, that the whole of the break which originally existed between the faces will have disappeared, and become filled up with copper.

With respect to the solidity (the degree of cohesion) of the galvanic soldering, it is the same as that of copper or other metal precipitated by galvanic agency. It will, moreover, be well understood, that a too energetic galvanic excitation must have an injurious influence upon the cohesion of the metal precipitated; and in this case precisely the same phenomena will be observed as those which have long manifested themselves in ordinary galvano-plastic operations.—[*Ibid.*]

ON THE SOLIDIFICATION OF MORTAR, AND ITS PROPERTY OF RESISTING THE ACTION OF WATER.

BY M. H. DE VILLENEUVE.

M. Vicot, in his researches into the action of cements, has pointed out the principal properties of different kinds of mortar, including that known as hydraulic mortar. The power of resisting the influence of water is communicated to lime by a certain combination of silica and alumina: this combination may be formed in two different ways; that is to say, either directly, by calcining calcareous clays, or indirectly and gradually, by the action of burned marl or clay upon lime.

The calcination of carbonate of lime, containing from 1 to 6 per cent. of clay, produces ordinary lime: if the quantity of clay

be greater (equal to from 6 to 23 per cent.), the lime is suitable to be made into hydraulic mortar. Beyond 23 to 27 per cent. of clay, the result of the calcination of the calcareous compound is termed cement. Marls and clays, subjected to a proper degree of heat, produce what is called pozzolana, which is more or less energetic, according to the purity of the clay from which it is obtained. Practical experience has shewn that, between the lime, suitable for hydraulic purposes, and cements, a line of demarcation exists, in the form of the lime containing about 23 to 28 per cent. of clay. This combination neither slacks into a powder when wetted with water, nor does it cohere permanently when mixed with water and beaten together.

When calcined calcareous compounds are moistened with water, they experience an augmentation of volume, owing to the solidification of a portion of water in combination with them, and the lime breaks down into a powder. The combination with water takes place with a violence, rapidity, and heat, proportionate to the smallness of the quantity of clay;—the proportion of water absorbed also depends upon that circumstance. When water is made to act upon ordinary calcareous substances after calcination, the absorption of the water, and the breaking down of the lime, will not take place when it is of the kind containing from 23 to 27 per cent. of clay; but the mass will only be divided into lumps. It has been found that, when lime, containing from 23 to 28 per cent. of clay, and cements are submitted to the action of water at a high temperature, even if steam only be employed to moisten the lime, it will swell up and then fall to powder in the same manner as hydraulic lime; and the properties of the calcareous matter, slacked in way mentioned above, are equal to those of hydraulic lime of the best kind. If, on the other hand, instead of favoring the action of the water, it be impeded, either by keeping down the temperature, or by adding it only in small successive portions, the swelling up of the mixture, and the formation of that noxious combination of clay and lime, in which the former is in the proportion of 23 to 28 per cent. of the latter, can be checked at pleasure. This peculiar kind of lime, if submitted to the slow action of water, or even to the hygrometric action of the atmosphere, and afterwards pounded up, will however produce excellent cement. By submitting the argilliferous lime to the action of water, under certain conditions, it is capable of being used in the place of hydraulic lime of the best quality; and, by treating the same kind of lime with small quantities of water at a low temperature, and afterwards grinding the mass, as above described, a valuable material for cement is obtained. Certain carbonates of lime, sometimes termed sub-carbonates, give rise to a product similar to the argilliferous lime; and, if slightly moistened and ground, it produces durable cement, which can be employed alone, or mixed with ordinary hydraulic lime. If the action of the water on the sub-carbonates be assisted by heat, it falls into powder in the same manner as common lime. If the

temperature be raised, the substance is acted on like a mixture of lime and the neutral carbonate of lime,—a phenomenon similar to the decomposition which is observed when hydraulic lime is acted on by a large quantity of hot water. By causing water to act slowly upon the imperfect carbonate of lime, or rather by exposing it to the hygrometric influence of the air, and afterwards grinding the mass, a substance is obtained capable of persistent cohesion. These considerations led to the belief, that the hydraulic property of some kinds of lime is attributable, not only to the presence of silica and alumina, but to that of carbonic acid, or, indeed, any other electro-negative substance, which can form an insoluble combination with lime. Insolubility must, then, be looked upon as the essential peculiarity of hydraulic lime. Carbonic acid renders lime hydraulic, not only by directly combining with it, but also by the indirect action, as in pozzolana;—thus, cement, and hydraulic lime which, by long exposure to the air, has become charged with carbonic acid, may be mixed with ordinary quick-lime; and may then be used in the place of pozzolana of the best kind. By pounding hydraulic mortar, after it has stood for four years, a true pozzolana was produced, which became quite fixed, under water, in the space of fourteen hours. As a hydraulic principle, carbonic acid is the most economical; but it does not produce the most cohesive mortars and cements.

A calcination, or moderated roasting, produces a modification in calcareous clays, by which they are brought to a very similar state to lime, containing 23 to 28 per cent. of clay. The hydration of these substances, increased by heat, or impeded by a low temperature and a limited supply of water, gives rise to two classes of products, viz., hydraulic lime, and cement. These latter products are, moreover, endued with a remarkable degree of cohesion; indeed, cement has been produced by this process, capable of scratching the surface of marble. The most remarkable results of this kind are, however, obtained from calcareous clays, rich in alumina; these are the compounds which experience the highest degree of contraction in the process of calcination. From what has been said, it appears that the various products of the calcination of calcareous compounds have each a certain utility, and that they may be all profitably employed either before or after being burned. Practically, it is seen that hydraulic lime may be obtained economically in all localities where beds of chalk or limestone are formed, and that the various products of the unequal calcination effected in ordinary kilns may be turned to advantage.

For fifteen years the system above detailed has been tried in some parts of France. 350,000 cubic yards of masonry, on the railway from Marseilles to Avignon, prove at the present moment the advantages of the system; in the neighbourhood of Marseilles there are upwards of a million of cubic yards of masonry, constructed with hydraulic mortar (made as above deseribed), at a price not exceeding that of work executed with mortar made from ordinary lime.—[*Comptes Rendus.*]

ON THE BRONZING OF PLASTER FIGURES.

BY M. L. ELSNER.

THE following receipt was given, some time since, in a scientific journal, for bronzing plaster figures:—"Dissolve 500 parts of white soap in water, and add thereto 150 parts of sulphate of copper; a green precipitate is thus formed, which wash and dry, and re-dissolve in essence of turpentine, or other siccative essence; with this solution coat the figures required to be bronzed (having previously heated them), and, when dry, they will possess a fine bronze color."

M. Elsner states, that, by following the above directions, a good imitation of bronze is not obtained, as the preparation acquires a grass-green color, and has not the tone of bronze. On the other hand, a brownish-green bronze may be very easily obtained, by adding to a solution, in water, of palm-oil soap, a mixture of sulphate of iron and sulphate of copper, in solution: this furnishes a brownish-green precipitate, the color of which may be modified at pleasure by the addition of a greater or less quantity of one or other of these salts. The precipitate, after being washed and dried, is re-dissolved in a siccative essence, or a mixture of good varnish of linseed-oil and wax; and, with this solution, the figures (having been previously heated) are coated: on drying, they will be found to possess a brownish-green bronze color.

The yellow principle, obtained in a solution of palm-oil soap by means of a solution of sulphate of iron, is palmitate of iron, as the palm-oil soap may be considered to consist, in great part, of palmitate of soda. Palmitate of copper has a grass-green color. These two mĕtallic soaps are both soluble (without losing their color), by the help of heat, in essence of turpentine and fatty oils.

A soap, for obtaining this bronze color, may also be prepared with linseed-oil and caustic soda-lye,—treating the liquor with a solution of a mixture of sulphate of iron and sulphate of copper, and treating the precipitate formed as above. Palm-oil soap, which is to be met with in commerce, seems however much better adapted for the purpose.

Plaster figures may also be covered with a brownish-yellow bronze, by laying over them a coating of mosaic gold (sulphuret of tin) and linseed-oil varnish.

M. Elsner states, that he has succeeded in obtaining a much better result, by employing a solution of the salt of iron only, instead of a mixed solution of the sulphates of iron and copper, for forming a precipitate from the soapy solution; as, by that means, a soap of definite composition is obtained, and, consequently, a determined brown-yellow color. On afterwards dissolving the metallic soaps, separately, by means of heat, in a fatty excipient, and pouring one solution into the other, the shade required for imitating bronze may easily be determined.—[*Ibid.*]

THE SUBMARINE TELEGRAPH BETWEEN DOVER AND CALAIS.

[For the following piece of intelligence, which shews something more than the daring of the present generation, we are indebted to the *Times* of Thursday, 29th ult.]

Straits of Dover, Wednesday Evening.

THE interesting experiment of sinking submarinely, with success, the electric telegraph between this port and Calais, and which is destined to form the future key for instant communication with the European continent, was practically commenced this morning at half-past 10 o'clock, at which hour the Goliah steam-ship, provisioned for the day, and with a crew of some 30 men, was brought under weigh within the harbour. There were on board Dr. Reid, Mr. J. C. Wollaston, C.E., Mr. Crampton, C.E., Mr. J. Edwards, Captain Beer, and several scientific gentlemen, with many persons on the pier to see the convoy start. The Goliah rode out to the Government Pier with her telegraphic tackle and apparatus on board, under a calm sea and sky, and a favoring wind. The connexion between the 30 miles of telegraphic wire, 1-10th of an inch in diameter, and encased in a covering of gutta-percha, the thickness of a little finger, and which was coiled round a large cylinder or drum amidship, 15 feet by 7, was then made good to 300 yards of the same wire enclosed in a leaden tube on shore, to prevent its being bruised by the shingle on the beach, and to enable the experimenters, as they proceeded out to sea, to send communications on shore. The vessel being fully under weigh, steamed out at the rate of three or four miles an hour into the open sea, in a direct track for Cape Grinez, 21 miles across channel, the nearest landmark to the English coast, and lying midway between Calais and Boulogne. The wire weighed five tons, and the cylinder two. The vessel was preceded by Captain Bullock, R.N., of Her Majesty's steam-ship Widgeon, who accompanied the experimenters as a pilot, and who had caused the track of the navigation to be taken to be marked out by a succession of buoys, surmounted with flags, on the whole route between the English and French coasts. The operation of paying out the 30 miles of wire commenced, on a signal to the sailors to "Go a-head with the wheel, and pay out the wire," which was continuously streamed out over a roller at the stern of the vessel; the men at every 16th of a mile being busily engaged in rivetting on to the wire square leaden clamps, or weights of from 14lb. to 24lb., and which had the effect of sinking the wire in the bottom of the sea, which, on the English coast, commences at a depth of 30 feet, and goes on varying from that to 100 and 180 feet, which latter, or 30 fathoms, is anywhere the greatest depth. The whole of the casting out and sinking was accomplished with great precision and success, owing to the favorable state of the day.

Various interesting salutations were kept up hourly, during the

progress of submerging the wire, between the gentlemen on board and Messrs. G. and W. Brett, the original promoters of the enterprise. The only conjectured difficulty on the route was at a point in mid-channel called the Ridge, between which and another inequality, called the Varne, both well known and dreaded by navigators, there is a deep submarine valley, surrounded by shifting sands,—the one being 17 miles in length and the other 12, and in their vortex, not unlike the voracious one of the Goodwin Sands, ships encounter danger, lose their anchors, and drift; and trolling nets of fishermen are frequently lost. Over this, however, the wire was successfully submerged, below the reach, it is believed, of either ships' anchors, sea animals, or fishing-nets. The remainder of the route, though rougher on approaching the coast of France, was accomplished cleverly, but slowly; but, as the expedition had not reached its destination, to enable our correspondent to announce the gratifying fact under the bottom of the sea by telegraph, and thence by the last express from Dover at 8 o'clock, he will be compelled to postpone it until such time thereafter as the Goliah shall have reached Cape Grinez.

(BY SUBMARINE TELEGRAPH.)

Cape Grinez, Coast of France,
Half-past 8, P.M.

The Goliah has just arrived in safety, and the complete connexion of the underwater wire with that left at Dover this morning is being run up the face of the cliff; complimentary interchanges are passing between France and England, under the strait and through it, for the first time. The French mail, *ut mos est,* may not arrive at Dover at the time of going to press, but, in a short time, on the necessary arrangements being complete, Paris news, and closing prices at the Bourse, will be communicated by a mail that sets time and detention at defiance.

TRANSACTIONS OF THE INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

Wednesday, 24th July, 1850.

J. E. M'CONNELL, Esq., Vice-President, in the Chair.

[*Being the first meeting of the members of the Institution in their new house, Newhall Street.*]

At the completion of some preliminary and formal proceedings the Secretary read the following paper, by Mr. William Smith, of Dudley :—

On the condensation of steam in the engines of the South Staffordshire Iron District, and the improvements to be effected in them.

The object of the present paper (which was accompanied by a series of indicator diagrams, taken from the several engines by the author of the paper) is to shew the working condition of forty-

eight of the largest class of mill, forge, and blast engines in South Staffordshire, with some remarks as to the practicability of improving them.

The general character of the indicator diagrams of the majority of these engines shews a considerable pressure of steam, nearly uniformly sustained throughout the whole stroke of the piston, and averaging about 12 lbs. per square inch above the atmosphere in the forge and mill engines, and about 7 lbs. per square inch in the blast engines; with a very defective vacuum, commencing about the atmospheric line, and reaching only from 7 lbs. to 11 lbs. per square inch below the atmosphere at the end of the stroke,—the average vacuum being about $6\frac{1}{2}$ lbs. per square inch below the atmosphere throughout the stroke. Some of the indicator diagrams from blast engines shew a considerable expansive action, but not a good vacuum.

The indicator diagrams from a mill engine of 42-inch cylinder and 7-feet stroke, and making 17 strokes per minute, shew that the engine worked very imperfectly as respects the condensation of the steam, but that it has been improved to a remarkable extent, by an alteration made for the purpose of improving the vacuum, and a very considerable saving in the consumption of fuel has been effected. This engine was working with $19\frac{1}{2}$ lbs. pressure of steam at the beginning of the stroke, continued to $17\frac{1}{2}$ lbs. pressure at the middle, and reduced to 6 lbs. per inch at the end of the stroke, by wire-drawing the steam without any cut-off expansion valve,—the average pressure being 16·37 lbs. per square inch throughout the stroke. The average vacuum was only 2·72 lbs. per square inch below the atmosphere, beginning a little above the atmospheric line, and reaching only 5 lbs. below the atmosphere at the end of the stroke. This performance being so bad, it was considered necessary to examine the engine; and the cause was found to be from the valves, thoroughfares, and condenser being much too small for the proper proportion,—the steam and eduction-valves being only 7 inches diameter, and the thoroughfares of the same size. These were therefore removed and replaced by others,—the steam-valves being 10 inches diameter, and the eduction-valves and thoroughfares 12 inches diameter, or three times the area of the original ones. The condenser was also nearly doubled in capacity, by attaching a large vessel on the top of it, which made it rather larger than the regular proportion. The air-pump was only 24 inches diameter, with half the stroke of the steam-piston, or about $\frac{1}{5}$th less contents than the regular proportion for the size of the cylinder: this was not altered; but there was an abundant supply of cold water for injection.

The result of the above alteration was, that the steam pressure, having been 8 lbs. at the beginning, was reduced to about the atmosphere at the end of the stroke,—making an average of 5·40 lbs. instead of 16·37 lbs. per square inch pressure throughout the stroke. The vacuum commenced at $10\frac{1}{2}$ lbs. and ended at 11 lbs.,

the average being 10·15 lbs. instead of 2·72 lbs. per square inch below the atmosphere throughout the stroke: the improvement in the vacuum amounts, therefore, to a constant average pressure of 7·43 lbs. per square inch throughout the stroke. The total power of the engine, as shewn by the first diagram, was 19·09 lbs. per inch on the piston throughout the stroke,—being 190 horse-power: consequently, this improvement of the vacuum amounted to 39 per cent. of the total power of the engine, or 74 horse-power.

The mode of effecting the above alterations was shewn by drawings accompanying the paper.

In addition to enlarging the capacity of the condenser, a further improvement was also made by cleaning out the deposit of lime, and adding an internal injection-pipe and rose. There was no internal injection-pipe previously, but simply a hole in the side of the condenser, where the injection-cock was fixed on, and, consequently, the injection water was much less efficient in condensing the steam;—it being poured into the condenser in a single stream, instead of being scattered in a number of small jets from the rose end of the pipe.

The majority of engines in this district are similar in this respect; and the reason that has been given is, that the rose is apt to get the holes choked up by deposit from the water, which is very much impregnated with lime. This is a matter requiring particular attention in this district; and cases have come under the writer's observation where condensers were filled by the deposit, in the course of two or three years time, to such an extent that the capacity was reduced fully one-half, as well as the passage through the foot-valve. It is a very hard calcareous deposit, which adheres firmly to the cast-iron, and requires considerable labour to cut it out, involving a serious stoppage of the engines; and they were consequently worked as long as possible before taking off the condenser-cover to cut out the deposit, which increased to 7 inches thickness, and as much as half a ton weight in one engine.

Besides the very important saving effected by the greater power obtained from the steam, in consequence of the improvement of 39 per cent. in the vacuum, as described above, the engine has been found to do the work more regularly and satisfactorily since the alteration than before; it was liable to be pulled up by any extra strain of the rolls, &c., whenever the piston was getting in want of repacking,—the leakage of steam injuring the vacuum on account of the very deficient condensing power; but that has not occurred since the alterations were made.

The engine drives a merchant mill of 3 pairs of rolls, a guide mill of 3 pairs, 2 pairs of forge rolls, a forge hammer, 2 shears, and a pump for draining the foundations. It was not stopped longer than three days to make the whole of the alterations described above.

Another engine of similar construction and size to the preceding was also examined, in consequence of the imperfection in its condensing. The valves and thoroughfares were found to be 10 inches diameter, but the valves had not sufficient lift; the eduction pipe to the condenser was 9 inches diameter; and the condenser was 2 feet 4 inches diameter, and 4 feet 6 inches high. The eduction pipe was then removed and replaced with one 12 inches diameter; a large vessel was fixed on the top of the condenser, which increased its capacity about one third; and the lift of the valves was then increased from $1\frac{1}{8}$ inch to $2\frac{3}{8}$ inches. The result of the alteration was an improvement in the vacuum of from 1·50 lbs. to 7·97 lbs. per square inch below the atmosphere, or 6·47 lbs. per square inch increase of average pressure throughout the stroke.

The saving of fuel from these alterations has not been well ascertained, as the engines in both cases are worked from a series of boilers, which also supply steam to other engines upon which the load is very unequal; but the saving is admitted to be very considerable, for the proprietors have been enabled to use an inferior description of slack, and also to throw off one boiler, with a fire-grate about 7 feet square, and 45 square yards of heated surface, without any diminution in the power employed.

The aggregate power of the (45) mill, forge, and blast engines, from which the indicator diagrams are taken, is nominally 3240 horse-power, according to Boulton and Watt's proportions of the cylinders; but, by the calculation of the indicator diagrams, the total is 7819 horse-power. The average vacuum obtained in the present working of all the engines is about 6 lbs. per inch below the atmosphere throughout the stroke; omitting from the average four, which are exceptions to the general run of these engines; and the average vacuum obtained in the 6 expansive engines, of which indicator diagrams are also given, is $10\frac{1}{2}$ lbs. per inch below the atmosphere throughout the stroke. The loss of power from the imperfect vacuum in the former engines may therefore be taken at the difference between these pressures, or $4\frac{1}{2}$ lbs. per square inch pressure throughout the stroke, which amounts to 1930 indicated horse-power upon these engines; or, in other words, an additional power of 1930 horse-power, or 25 per cent. increased power might be obtained from the same expenditure of steam, and consequently of fuel, if the vacuum were improved so as to be as good as the average of the 6 expansive engines, or $10\frac{1}{2}$ lbs. per inch throughout the stroke. This vacuum has been obtained in the two engines already noticed; although the alterations were carried out only to a limited extent, and at a comparatively trifling expense; but if, in addition to the alterations made, expansive gear were employed, a much better effect would be obtained by using the same volume of steam expansively.

In many cases the expansive action is accomplished by the addition of a separate expansion-valve in the steam-pipe, which

is worked by a cam, so as to cut off the steam at any portion of the stroke that may be desired (this valve opening and shutting twice for each double stroke of the engine); and the steam and eduction valves are worked by a common excentric motion,—the top and bottom valves opening and shutting together. But this is an imperfect mode of obtaining expansion; because the steam filling the side pipe and the two steam-chests expands after the cut-off valve is shut; and this steam forms a considerable proportion of the contents of the cylinder.

The only efficient mode of applying expansive action is by lifting each valve by a separate cam, so adjusted as to shut each steam-valve at whatever point of the stroke may be desired, whilst the eduction valve is held open till the termination of the stroke: by which means the full effect of the expansive action is obtained.

But independent of the loss sustained by not working expansively,—the loss of power in the engines described being 1930 horse-power, as shewn before,—the annual loss in money by extra consumption of fuel in these engines, calculating 20 lbs. of slack per hour, for one horse-power, at a cost of 3*s.* per ton, will amount to £18,610, or £2. 7*s.* 7*d.* per horse-power per annum.

The total power of the steam-engines employed in the manufacture of iron in this district may be computed to be fully ten times the nominal power above named; and the total annual loss to the proprietor, from the causes described in the present paper, may be therefore taken in round numbers at £180,000 per annum; as the more expansive engines, described above, may be considered a fair average of the engines in the district.

It has been generally considered hitherto that the improvement of expansive action of steam was not applicable advantageously to the engines of this district, because of the small cost of the fuel employed; but this will be seen to be an erroneous conclusion from the actual results of the alterations described above, where the improvement was only effected in the vacuum, and the expansive principle was not carried out, which would have effected a still greater saving. The total quantity of fuel consumed at present is so large, that, although the price per ton is insignificant, the total amount of saving effected by the per centage on the whole is very important.

In addition to the saving in cost of fuel consumed, a very important saving would also be effected in the tear and wear of the boilers, which is fully in proportion to the extra fuel burnt under them, and the repairing of which is invariably attended with serious inconvenience and expense.

The description of boilers in general use in the district, and the further saving to be effected by improvements in their construction and mode of setting, being an important practical subject for consideration, will form the subject of another paper, to be laid before the Institution at a future meeting.

The Chairman said, he believed the writer was quite within bounds when he estimated the saving in fuel which might be effected in that district alone at £180,000 per annum; nor was the subject of importance in that light merely; because it was found to prevail as a general rule, that the amount of destruction in machinery and boilers was nearly in proportion to the quantity of fuel consumed. He had remarked at a former meeting on the practical importance of obtaining comparative accounts as complete as possible of the consumption of fuel and economy of working of the steam engines in the different districts of the country; and he thought that all information of that kind was of great practical value.

Mr. Bowman enquired whether, in most of the engines mentioned, the proportions of Boulton and Watt were observed in the condenser?

Mr. W. Smith replied, that, speaking generally, he believed that was the case; but the bad working of the engines was accounted for by the extraordinary pressure of the steam used. The error was, that engines intended and proportioned for 3 lbs. steam were worked up to 12 or 16 lbs. per inch throughout the stroke, and, consequently, they were very imperfect in their condensing; as there was so much more steam to be condensed at each stroke, when the cylinder full of high-pressure steam expanded down to the same pressure as the low-pressure steam.

Mr. Bowman observed, that this would seem to imply that the size of the condenser should be regulated by the pressure of the steam in the cylinder.

Mr. Cowper said, the pressure of the steam was certainly a necessary element to be taken into consideration, as well as the size of the cylinder, in determining the size of the condenser. There was not only a greater quantity of steam to condense when a higher pressure was employed, but also a greater quantity of air to pump out at each stroke of the air-pump. He mentioned a case which came within his own observation in that district, where 18 lbs. steam was employed; there was no barometer gauge, but the parties were satisfied that they had a good vacuum; however, the fact was, that the injection water was forced into the condenser by means of a cistern at the top of the engine house, 22 feet in height.

Mr. Slate remarked, that he fully concurred in the results obtained by Mr. Smith, but feared they were so startling that there would be a disinclination to give them credence in the district. It was highly important then that the truth of the deductions should be practically admitted.

Mr. T. Thorneycroft, as an iron-master of the district referred to, felt extremely obliged to the author of the paper for pointing out the means whereby any saving could be effected, more especially at a time when, owing to the state of the trade, economy in the manufacture was so essential.

Mr. W. Smith said, it had often occurred to him, that a steam-engine was like no other machine. A time-piece, if out of order, was sent back to the maker to be repaired; and in the case of machines of other descriptions, if they did not do their work well they were immediately stopped, because they wasted and injured the material upon which they were employed. But when the old steam-engine, after twenty or thirty years of hard labour, shewed some symptoms of disorder, it could not be stopped; so, with an extra application of the coal shovel, and some hammering at the cotters, &c., it was set to work again, and with its powerful steam arm it wound round all the complicated machinery. This, however, was done at an enormous expense to the proprietor of the engine; and it would be much better if he were to renovate its constitution. He trusted that the exertions of the members of the Institution would have some influence in shewing to persons of the description referred to, the necessity of carrying out these things on more efficient principles than they had hitherto been conducted.

Mr. Bowman thought it a matter of great importance that the injection water should spread itself out amongst the whole quantity of steam immediately on its passage into the condenser; and the alteration made by Mr. Smith in the mode of injection was very advantageous.

Mr. Cowper observed, that they ought all to add their testimony to the value of the indicator figures produced by Mr. Smith, because they shewed the character of the engines much better than any judgment which could be formed with reference to them; inasmuch as it was the character of each engine written by itself, and could not be erroneous. He had not the slightest doubt that a loss of £180,000 at least, as stated by Mr. Smith, was sustained in that district, because the mode of condensing ordinarily adopted was exceedingly defective. It had occurred to him, many years ago, that a valve might be put at the side of the condenser, and connected with an injection pump; so that a gush of cold water might be injected at every stroke, at the very moment of the entrance of the steam into the condenser, and shut off again immediately,—by which means the greatest possible use might be made of the injection water, and the condensation of the steam effected with a smaller quantity of injection water.

He then explained the drawing of an improved injection-valve which he had constructed, and found to work very successfully: the object was to maintain the full pressure of the water at the point of entrance into the condenser, and to obtain a more efficient distribution of the jet of water without danger of its getting choked. In the sectional view, fig. 1, Plate VI., A, is the condenser; B, the eduction-pipe; C, the air-pump; D, the cold-water cistern in which they are immersed; and E, is the injection-valve, a conical valve rising a little above the bottom of the condenser, with a perforated cap below in the cold-water cistern: this

valve is lifted by the screwed rod F; and the admission of the injection water can be regulated with the greatest accuracy by the screw. The water enters the condenser in a fine sheet all round the valve, which strikes the sides of the condenser, and fills the whole space with a fine spray. He had ascertained this by trying the valve in a box similar to the condenser, but partially open, with a column of water of the same pressure as the injection; and he found the distribution of the water was so perfect as to fill the box with a complete spray or fog. There was also a different construction in the air-pump which he considered advantageous: the bottom dropped into a well G, G, in the bottom of the condenser, and the water rose up the space G, G, when the air-pump bucket dipped into it, forming a water-valve instead of the ordinary foot-valve, and giving pressure enough to ensure the bucket-valve opening if there was any obstruction.

Mr. Cowper, to prove the utility of his improvement, shewed an indicator figure, taken from an engine to which his injection-valve had been applied: the engine, when in full work, at 24 revolutions per minute, drove shafting and two fans, amounting to $72\frac{3}{4}$ indicated horse-power. The engine is high-pressure, expansive and condensing, and is one of a pair working coupled together. There was originally in their place, a pair of high-pressure engines, non-expansive and non-condensing; and the comparative economy of power effected by the present engines is so great, that, although the same boilers only are used, there is $2\frac{1}{4}$ to $2\frac{1}{2}$ times the power obtained.

Mr. Slate thought the plan of injection proposed by Mr. Cowper, was a very eligible one. With reference to the alternate injection of the water, he had experienced the difficulty in marine engines of too much water being admitted by the injection cock, whenever the engines were working slowly—causing the injection water to choke up the condenser and even get up into the cylinder; and he had adopted a slide-valve in the injection-pipe, admitting only water enough at each stroke of the engine for the condensation of the steam: the jet of water was thrown against a perforated distributing plate.

The Chairman remarked that there would be a tendency in the rose of the injection-pipe (as adopted by Mr. Smith) to become choked up.

Mr. Cowper observed that, in the plan he had described, that difficulty was quite obviated; as, in the case of the circular valve becoming choked, they had only to lift it up an inch or two by the screw handle, and then screw it down again, and the rush of water would effectually wash out any obstruction.

The following paper by Mr. ARCHIBALD SLATE, of Dudley, was then read:—

On a blowing-engine working at high velocities.

In introducing to the meeting the proposal for working blowing-engines at high velocities, the writer of the present paper wishes shortly to direct attention to the various changes through which this description of engine has passed, the better to elucidate the difficulties to be overcome, and the advantages to be derived from the further change now proposed.

The immediate cause of the writer's attention being attracted to the improvement of the blowing engine was the difficulty experienced in regulating one of the old construction of blowing engine in the latter part of 1848, and having at the same time occasion to employ some small 9-inch cylinders driven by the air of the large blowing engine. These small cylinders, when driving the shafting only, sometimes attained a velocity of upwards of 200 revolutions per minute, suggesting the idea of the possibility of reversing their motion and taking in the air in place of blowing it out through them: there was, however, a difficulty in the slide-valve, which did not open and shut fast enough. After some consideration it was agreed that another cylinder should be prepared, and the centre port made much larger, and the slide overtravelled nearly half its stroke in excess, which had the desired effect;—a cylinder of 9 inches diameter, and 1 foot stroke, having been driven 320 revolutions, or 640 feet per minute, discharging the air at a pressure of $3\frac{1}{2}$ lbs. per square inch, through a tuyere of $1\frac{1}{8}$ inch diameter, or $\frac{1}{64}$th of the area of the blowing piston. This performance, as is well known, is more than double that of any ordinary engine,—the total area of the tuyeres, with a 90-inch blowing cylinder, being, at a pressure of $3\frac{1}{2}$ lbs., about 52 circular inches, or $\frac{1}{144}$th of the area of the blowing piston.

We are all acquainted with the tremour which is felt even in the best form of the large sized engines; but in the experiments at a high velocity with the small sized cylinders, not the slightest jar was felt or noise heard; it is therefore proposed to increase the speed of the piston, in actual practice, from 640 to 750 feet per minute;—the length of stroke being 2 feet in place of 1 foot: this is somewhat under the speed of a locomotive piston at 40 miles per hour, which is about 800 feet per minute; so that it is conceived no difficulty can present itself to this. The proposed speed of 750 feet per minute is three times the usual speed of the present blowing engines, viz., 250 feet per minute.

The construction of the proposed engine is shewn in sectional plan at fig. 2, Plate VI.; *a, a,* are the steam cylinders, 10 inches diameter, and 2 feet stroke; and *b, b,* the blowing cylinders, 30 inches diameter and 2 feet stroke, with their pistons *c,* fixed on the same piston-rods *d,* which are connected to two cranks *e,* fixed at right angles to each other on the same shaft. The slide-valves *f,* of

the steam-cylinders are worked by the excentrics *g*, on the cranked shaft; and the cranks *h*, at the outer ends of the same shaft, work the slide-valves *i*, of the blowing cylinders. The centre port *k*, passes downwards to an external opening for the admission of the air; and the discharge ports *l*, *l*, deliver into the passages *m*, on the top of the cylinder, which communicate with the air main *n*, by the chest *o*, formed between the cylinders. The piston of the blowing cylinder is made without any packing, it being a light hollow cast-iron piston, turned to an easy fit; and the slide-valve of the blowing cylinder has a packing-plate at the back, working against the cover of the valve-box, with a ring of India-rubber inserted between this plate and the back of the valve, to give a little elasticity.

It appears that 30 inches diameter is somewhere about the most convenient size for a stroke of 2 feet; and as it is considered an advantage to have the stroke as short as possible, to increase the regularity of the blast, the estimate given of the cost of the different engines has been taken upon this basis; two 10-inch steam-cylinders and two 30-inch blowing cylinders (costing together, exclusive of the boilers, about £400), being reckoned equal to blow a furnace making 160 tons of iron per week, and having a surplus equal to blowing a cupola or refinery, as is generally allowed; as such an engine would give at 640 feet per minute (the same speed of piston as in the experiments) very nearly 30 circular inches of tuyere, at a pressure of $3\frac{1}{2}$ lbs. to the square inch: the circular inch is used in speaking of the area of tuyere, as the blast that any furnace is taking is usually reckoned by simply squaring the diameter of the tuyere; but the pressure is taken on the square inch.

The experiments on which these calculations were founded, having been made upwards of 12 months ago, were repeated last week, and the results were found to be, as nearly as they could be measured, the same: the blowing cylinder had, in the interval, been driving the lathes in the pattern shop, and the slide was found perfect. An indicator was applied with a view to test the amount of friction of the air in entering the cylinder at the high velocity; and a simple method was adopted of ascertaining this. A tuyere was made as large as the inlet port, and the engine was driven to nearly or quite 700 feet per minute, when the gauge shewed a pressure of $\frac{1}{4}$ of a lb. per square inch; and, as the friction would be the same through the same sized openings at other pressures, it follows that the loss by friction on a pressure of blast of $3\frac{1}{2}$ lbs. per inch, would be $\frac{1}{15}$th, or $6\frac{2}{3}$ per cent. loss. As the port in this case was $\frac{1}{11}$th of the area, and the port proposed is $\frac{1}{8}$th, it is assumed that the loss would not exceed 5 per cent. from this cause, or, indeed, from any other cause; as the friction from propelling the air through a given sized tuyere, at a given pressure, must be the same in both cases.

Following up the comparison of first cost, we find that (exclu-

sive of boilers, which are assumed the same in both cases, but taking into account the cost of the engine-house) there would be a saving by the proposed plan of between 65 and 70 per cent.: the cost of a pair of the best engines in Staffordshire, blowing three furnaces, being £3,650; while, on the proposed plan, they would cost £1,100, if high pressure only,—or, if high pressure and condensing, £1,350, including in each case the engine-house, but not the boilers.

Many will prefer high pressure only, on account of its simplicity; but as it appears evident that a given quantity of steam can be condensed in the same time, in the same condenser, whether admitted in a few large jets, or in a great number of small jets, there is no reason whatever why a condensing apparatus may not be attached to the short stroke engine at high velocities;—the only condition being, that it must be equivalent to the power of the engine, without relation to the size of the cylinder. The air-pump, in this case, must be double acting, with slide-valves; or it may be rotary, and placed round the crank-shaft; and there appears to be no advantage in a fly-wheel for such an arrangement of blowing engines.

The speed of the engine should be regulated by a hydrostatic governor, communicating with the blast main, and attached to the throttle-valve, exactly similar to those used in gas works for regulating the engine which drives the exhausters. This would regulate the engine with greater delicacy, and maintain a more uniform blast than can be done with the present engines; and the rapid succession of the strokes of the two small blowing cylinders, acting alternately, would render the present large reservoir quite unnecessary.

Supposing the advantages claimed for this description of engine to be realized, which the writer has no reason to doubt, it may be applied to assist the present blowing engines where they are overpowered, which is in many instances the case; as there is no ready means of increasing their power as the works develop themselves, and greater calls are made on the engine; but in the case of the proposed engines, if at any time an increase were desired, another blowing cylinder might be added to the shaft, at a comparatively small cost.

Referring again to what first drew the attention of the writer to this subject (the employment of small cylinders worked by the pressure of air, where it was inconvenient or impracticable to employ shafting), it has been found that a 12-inch air cylinder, with 3 lb. pressure, attached to a large foundry crane, under which fifteen 30-inch pipes are cast vertically every ten hours, does the work of double the number of men that could by any possibility work at the crane.

This suggests the possibility of a very considerable advantage to railway companies, by the use of the proposed engines; as the blowing-cylinders for compressing the air might be attached to

the end of the piston-rod of any of the small-size engines now laid up at several stations, and the air conveyed to the various cranes, to which cylinders might be attached for about £25 per crane, without disturbing the present arrangement for the use of manual power in cases of emergency.

The Chairman enquired if Mr. Slate could furnish them with any comparison of the advantages of the proposed blowing-cylinder and the fan-blast, which had been so well developed by Mr. Buckle at a former meeting.

Mr. Slate said, he had used fans made according to Mr. Buckle's principle, and could speak to their excellence and superiority; they were the least expense in construction, being made with light wooden arms; and he had obtained from $4\frac{1}{2}$ to 5 oz. per square inch pressure with them. He had tried both the cylinder-blast and the fan-blast for melting iron, and indeed had them both now in use; but he was of opinion the cylinder-blast was decidedly the best for the purpose; as the fan-blast caused the lining of the cupola to burn away quicker, and also consumed a larger proportion of fuel. He had found they could not blow so continuously with the fan-blast, and required to stop more frequently for repairs of the lining than with the cylinder-blast. The pressure of the fan-blast was not sufficient to carry it through the burden; so that the passage of the air was more at the sides of the cupola, which caused the lining to be cut away; and hence he considered the cylinder-blast was the best for melting iron; and though it might not be so cheap at first cost, there was no doubt of its ultimate economy.

Mr. Davies enquired, whether the iron manufactured was equally good with the cylinder-blast as with the fan-blast; and whether the hard blast did not harden the iron.

Mr. Slate had at one time entertained a similar idea, but he had tried both extensively, and in the thousands of tons which he had melted, he had been unable to detect any difference between the quality of iron made under the influence of the fan and that made by the cylinder-blast.

Mr. Slate, in answer to an enquiry of Mr. Robinson's, stated that the pressure with the cylinder-blast was about $3\frac{1}{4}$ lbs. per inch at the cupola, and they had six 1-inch or $1\frac{1}{8}$-inch tuyeres. In the case of the fan they had two tuyeres about 6 inches diameter. They used best Durham hard coke, because light coke was useless with the cylinder-blast, which would blow it away.

Mr. Davies said, he made an exhauster that had been used extensively for blowing copper-melting furnaces; but he believed the fan was preferred, though it gave less pressure of blast.

Mr. Robinson thought the fan-blast was best for a cupola; and he could not see the reason why the cylinder-blast should not injure the sides of the cupola more than the fan-blast, because it had

greater pressure, and must have more power to force its way through to the opposite side.

Mr. Slate said, the result of his observations had been that the cylinder-blast caused the least injury to the lining; and he considered that it forced its way better amongst the coke and material, on account of its pressure being so much greater than the fan-blast. He found the lining of their cupolas that had the fan-blast seldom lasted more than a few days without stopping for repairs; but those with the cylinder-blast would work for some weeks with only casual repairs.

Mr. Cowper thought there would not be any greater destruction of the lining with the fan-blast, unless there were some other cause: the circumstance of blowing with 6 tuyeres in the one case, and only 2 in the other, might cause a difference. At the London Works the cupola was blown with a fan-blast, and had two 10-inch tuyeres at 5 oz. pressure, but they did not find the sides cut away; on the contrary, with some trifling repairs each morning before starting work, the lining of the cupola lasted for many weeks. In his opinion the fan-blast was preferable to the cylinder-blast for a cupola.

Mr. W. Smith remarked, that he did not know any instance of the fan being applied to blast-furnaces in that district; and it was for those more particularly that Mr. Slate's engine was proposed: the question raised by the paper was, whether, in the case of blast-furnaces, it was better to employ a small cylinder at a high velocity, or a large cylinder at a low speed. This small blowing-engine was proposed to supersede the ponderous machines which were employed for the purpose at the blast-furnaces; he considered it was an important suggestion; and he saw no reason why it should not accomplish the object intended.

Mr. Slate observed, that the practicability of working the blowing-cylinder at the quick speed had been proved by his trials with a cylinder driven by indirect power; and although he had not yet been able to try a complete blowing-engine, driven direct by a steam-piston as proposed, there was no difficulty to be overcome in driving the piston at the speed required, and the cost of the steam used would not be increased.

Mr. Cowper was of opinion that the proposed quick motion would give a more regular blast, which was a matter of great importance as affecting the make of iron; but it was a question whether the great speed at which it was proposed to be worked would not injuriously affect the durability of the working parts of the engine.

The Chairman did not think there was reason to fear any serious objection from that cause, when it was borne in mind that the piston of a locomotive engine frequently worked at the velocity of 800 feet per minute, and the proposed engine would be stationary instead of locomotive.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1850.

July 26. *Andrew Campbell*, of No. 43, Tottenham-court-road, for "the Argyll bouquet-holder and watch-protector."

27. *Samuel Perkes*, of Birkenhead, engineer, for a metallic folding bedstead.

27. *George Boulton*, of 12, Great Dover-street, Southwark, for an improved crosha (or crochet) and tambour-hook.

29. *Henry Broadhead*, of Beech-grove-terrace, Leeds, brush manufacturer, for an improved flat whitening brush.

30. *Joseph Mackenzie*, of Bideford, Devon, professor of music, for "the cheirosthenicon," an instrument calculated to give strength and flexibility to the fingers, and to communicate the equality of touch, so essential to correct and brilliant execution on the pianoforte.

31. *James Thornton & Son*, of Birmingham, for a signal lamp.

Aug. 2. *John Sanders*, of Birmingham, for a set of dies for making pressed hinges.

2. *William Palmer*, of Sutton-street, Clerkenwell, for a candle lamp.

3. *John Goode, Jun.*, of Birmingham, for a swivel.

3. *William Palmer*, of No. 144, Western-road, Brighton, Sussex, ironmonger, for a sculptor's, statuary's, and modeller's revolving table.

6. *John Martin*, of Killyleagh Mills, county of Down, Ireland, flax-spinner, for an arrangement of steam and water-pipes, to be applied in spinning flax, tow, and other fibrous substances.

7. *Robert Davies*, of 2, Globe-yard, South Molton-street, London, for a pipe-mount.

8. *George Hart & Sons*, of 127, 128, and 129, Union-street, Southwark, for a spring folding collegian cap.

8. *Joseph Welch & John Margetson*, of 17, Cheapside, London, for a folding trencher-cap.

9. *H. C. Windle & W. D. Blyth*, of Walsall, for a latch.

10. *Susan Hooper & Co.*, of Cottage-lane Works, Birmingham, for a register stove-top, with extra moveable door.

12. *Thomas & Charles Clark*, of Wolverhampton, Staffordshire, for a spring-hinge.

13. *Captain William Henry Armstrong*, of Claremont Lodge, Cobham, Surrey, for a rose-tree and flower-girdle.

15. *D. Y. Stewart & Co.*, of St. Rollox, Glasgow, for a core-carriage, for making and drying cores for metal pipes.

Aug. 15. *Thomas Moore Sharp*, of 17, Donegal-street, Belfast county, Antrim, for a sack-elevator.

16. *Joseph Salt*, of Uxbridge Common, Middlesex, for a pipe socket-die.

19. *Michael Neville*, of Great Charlotte-street, Liverpool, county of Lancaster, brass-founder, for an improved joint for fastening or attaching elbow and other pipes, &c.

19. *Thomas Busby*, of St. Marylebone Baths and Wash-houses, New-road, for an improved valve apparatus for baths.

19. *Henry Fletcher*, of Manchester, in the county of Lancaster, for a drawing-roller, employed in machinery for the preparation of cotton or other fibrous substances.

19. *Thomas Brooks*, of 26, Spital-square, Norton Falgate, for "the Sutherland silk."

20. *Lewis Lee*, of Woodbury, near Exeter, county of Devon, for a combined cultivating plough.

22. *Schofield, Brown, Davis, & Halse*, of 1, Gresham-street, London, for "the University cravat."

23. *J. Swain & Co.*, of Oxford-street, court tailors, for "the registered Syrian paletôt."

23. *J. Swain & Co.*, of Oxford-street, court tailors, for "the registered Syrian jacket."

24. *Samuel Rooke, jun.*, of 7, Whittall-street, Birmingham, brass-founder, for "the Oxonian ink-pot."

24. *Bernhard Samuelson*, of Banbury, Oxford, for a beater, to be used in making butter.

27. *William George Armstrong*, of Elswick Engine Works, Newcastle, for "the hydraulic equalizer."

List of Patents

That have passed the Great Seal of IRELAND, from the 17th July to the 17th August, 1850, inclusive.

To Eugene Ablon, of Panton-street, Haymarket, in the county of Middlesex, for improvements in increasing the draft in chimneys of locomotive and other engines,—being a foreign communication.—Sealed 31st July.

Joseph Barrans, of St. Paul's, Deptford, in the county of Kent, engineer, for improvements in axles and axle-boxes of locomotive engines and other railway carriages.—Sealed 1st August.

Thomas Dickason Rotch, of Drumlamford House, in the county of Ayr, for an improved mode of manufacturing soap,—being a foreign communication.—Sealed 1st August.

Thomas Keely, of the town and county of the town of Nottingham, manufacturer, and William Wilkinson, of the same place, frame-work knitter, for certain improvements in looped or elastic fabrics, and in articles made therefrom; also certain machinery for producing the said improvements, which is applicable in whole or in part to the manufacture of looped fabrics generally.—Sealed 3rd August.

Louis Napoleon Legras, of Paris, in the Republic of France, civil engineer, for certain improvements in the separation and disinfection of fecal matters in the manufacture of manure, and in the apparatus employed therein.—Sealed 3rd August.

John Gwynne, of Lansdowne Lodge, Notting-hill, merchant, for improvements in obtaining motive power, and in applying the same to giving motion to machinery,—being a foreign communication.—Sealed 6th August.

George Augustus Huddart, of Brynker, in the county of Carnarvon, Esq., for certain improvements in the manufacture of cigars, and certain improved apparatus for smoking cigars.—Sealed 16th August.

List of Patents

Granted for SCOTLAND, subsequent to July 22nd, 1850.

To Richard Archibald Brooman, of the Patent Office, 166, Fleet-street, London, patent agent, for improvements in types, stereotype plates, and other figured surfaces for printing from.—Sealed 26th July.

Donald Beatson, of Stepney, London, mariner, for certain improvements in instruments for taking, measuring, and computing angles.—Sealed 29th July.

Joel Spiller, of Battersea, Surrey, engineer, for improvements in cleaning and grinding wheat and other grain.—Sealed 29th July.

William Edward Newton, of the Patent Office, 66, Chancery-lane, London, civil engineer, for improvements in machinery or apparatus for making hat-bodies and other similar articles.—Sealed 30th July.

John Gwynne, of Lansdowne Lodge, Notting-hill, merchant, for improvements in obtaining motive power, and in applying the came to giving motion to machinery.—Sealed 31st July.

Walter Neilson, of Hyde-park-street, Glasgow, engineer, for an improvement or improvements in the application of steam for raising, lowering, moving, or transporting heavy bodies.—Sealed 2nd August.

George Gwynne, of Sussex-square, London, for improvements in the manufacture of sugar.—Sealed 7th August.

William Cox, of Manchester, cigar merchant, for certain improvements in machinery or apparatus for manufacturing aerated waters or other such liquids,—being a communication.—Sealed 7th August.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in obtaining, preparing, and applying zinc and other volatile metals, and the oxides thereof; and in the application of zinc or ores containing the same, to the preparation or manufacture of certain metals or alloys of metals,—being a communication.—Sealed 8th August.

Matthew Gray, of 3, Morris-place, Glasgow, practical engineer, for an improved method of supplying steam-boilers with water.—Sealed 9th August.

William Watt, of Glasgow, manufacturing chemist, for certain improvements applicable to inland navigation,—which improvements or parts thereof are also applicable, generally, to raising, lowering, or transporting heavy bodies.—Sealed 13th August.

George Augustus Huddart, of Brynker, Caernarvon county, for certain improvements in the manufacture of cigars, and certain improved apparatus for smoking cigars.—Sealed 14th August.

James Rennie, of Gowan Bank, Falkirk, Stirlingshire, for a certain improvement or improvements in the construction of gas retorts and furnaces, and in apparatus or machinery applicable to the same.—Sealed 14th August.

William Charles Bell, of Manchester, for improvements in apparatus connected with water-closets, drains, and cesspools, and gas and air-traps.—Sealed 14th August.

Henry Meyer, of the Strand, London, for certain improvements in power looms for weaving.—Sealed 14th August.

Read Holliday, of Huddersfield, for improvements in lamps.—Sealed 14th August.

William Mc Naught, of Rochdale, engineer, for certain improvements in steam-engines, and also improvements in apparatus for ascertaining and registering the power of the same.—Sealed 16th August.

Alfred Holl, of Greenwich, engineer, for improvements in steam-engines.—Sealed 16th August.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in the construction of ships or vessels, and in steam-boilers or generators,—being a communication.—Sealed 20th August.

Edward Highton, of Clarence Villa, Regent's-park, London, engineer, for improvements in electric telegraphs, and in making telegraphic communication.—Sealed 21st August.

Charles William Lancaster, of New Bond-street, London, gun-maker, for improvements in the construction of fire-arms, can-

non, and projectiles, and in the manufacture of percussion tubes.—Sealed 21st August.

William Dick, of Edinburgh, professor of veterinary medicine, for improvements in the manufacture of steel and gas.—Sealed 22nd August.

Thomas Lucas Paterson, of Glasgow, manufacturer, for certain improvements in the preparation or manufacture of textile materials; and in the finishing of woven fabrics; and in the machinery or apparatus used therein.—Sealed 22nd August.

New Patents

SEALED IN ENGLAND.

1850.

To Rodolphe Helbronner, of Regent-street, in the county of Middlesex, for improvements in preventing the external air and dust and noise from entering apartments,—being a communication. Sealed 31st July—6 months for inrolment.

Thomas Dickason Rotch, of Drumlamford House, in the county of Ayr, N. B., Esq., for an improved mode of manufacturing soap. Sealed 31st July—6 months for inrolment.

Matthew Trattles, of Rochester, in the county of Kent, toolmaker, for certain improvements in saw-sets, mallets, and other tools, and in apparatus and machinery for manufacturing the same. Sealed 31st July—6 months for inrolment.

John Sheafe Gaskin, Jun., of the Island of Barbadoes, in the West Indies, Gent., for improvements in the manufacture of rum,—to extend to the Colonies only. Sealed 31st July—2 months for inrolment.

Richard Archibald Brooman, of Fleet-street, in the City of London, for an improvement or improvements in abdominal supporters,—being a communication. Sealed 31st July—6 months for inrolment.

James White, of Holborn, in the county of Middlesex, mill-maker, for improvements in machinery for bruising, crushing, and for expressing juice from certain vegetable substances. Sealed 31st July—6 months for inrolment.

Henry Bessemer, of Baxter House, St. Pancras-road, in the county of Middlesex, engineer, for certain improvements in apparatus acting by centrifrugal force in the manufacture of sugar, and other improvements in the treatment of saccharine matter by such apparatus. Sealed 31st July—6 months for inrolment.

Juan Nepomuceno Adorno, of Golden-square, in the county of Middlesex, Gent., for improvements in manufacturing cigars and other similar articles. Sealed 31st July—6 months for inrolment.

Henry Rishton, of Kendal, in the county of Westmoreland, plumber, for certain improvements in water-closets and urinals. Sealed 31st July—6 months for inrolment.

Joseph Poole Pirsson, of the City of New York, United States of America, civil engineer, for certain improvements in steam machinery and apparatus connected therewith. Sealed 31st July—6 months for inrolment.

John Hynam, of Princes-square, Finsbury, in the county of Middlesex, chemical light manufacturer, for improvements in machinery for placing splints of wood, and wax, and composition tapers in frames for dipping. Sealed 31st July—6 months for inrolment.

John James Greenough, of George-street, Hanover-square, in the county of Middlesex, Gent., for improvements in obtaining and applying motive power. Sealed 31st July—6 months for inrolment.

Peter Fairbairn, of Leeds, in the county of York, machinist, and John Hetherington, of Manchester, machinist, for certain improvements in machinery or apparatus for preparing, spinning, and weaving cotton, flax, and other fibrous substances; also in constructing and applying models or patterns for moulding, preparatory to casting parts of machinery employed in preparing, spinning, and manufacturing fibrous substances; and also in certain tools to be used in making such machinery. Sealed 31st July—6 months for inrolment.

Matthew Gray, of Morris-place, in the City of Glasgow, practical engineer, for an improved method of supplying steam-boilers with water. Sealed 31st July—6 months for inrolment.

Edward Gabriel Leroy, of Paris, in the Republic of France, Gent., for certain improvements in locomotive engines, and in the means and apparatus to be employed for generating and condensing the steam to be used therein. Sealed 31st July—6 months for inrolment.

Joseph Shaw, of Paddock, near Huddersfield, in the county of York, cloth finisher, for improvements in constructing and working certain parts of railways. Sealed 3rd August—6 months for inrolment.

John Gwynne, of Lansdowne Lodge, Notting-hill, merchant, for improvements in obtaining motive power, and in applying the same to giving motion to machinery,—being a communication. Sealed 5th August—6 months for inrolment.

Francis Kane, of Berners Mews, in the county of Middlesex, chair-maker, for improvements in reclining chairs, in castors for chairs and other articles of furniture, and improvements in presses. Sealed 5th August—6 months for inrolment.

William Crosskill, of Beverley, in the county of York, civil engineer, for improvements in mills for grinding, splitting, pulverizing, and crushing grain, bones, bark, ore, and other hard substances; and for grinding paint and other soft substances;

and for shelling or removing the skin from rice and other grain; and in machinery for giving rotary motion to mills, thrashing-machines, and any other machine requiring rotary motion, to be communicated by any horse or other animal,—being a communication. Sealed 6th August—6 months for inrolment.

Alexander Melville, of Baker-street, Portman-square, in the county of Middlesex, Gent., and Edward Callow, of Park-road, Stockwell, in the county of Surrey, Gent., for certain improvements in muskets, cannon, and other fire-arms, and in explosive compositions and instruments. Sealed 6th August—6 months for inrolment.

Joseph Steele, of Chancery-lane, in the City of London, for improvements in coating and impregnating metals and metallic articles,—being a communication. Sealed 9th August—6 months for inrolment.

Henry Meyer, of the Strand, in the county of Middlesex, Gent., for certain improvements in power looms for weaving. Sealed 10th August—6 months for inrolment.

Selim Richard St. Clair Massiah, of Alderman-walk, New Broad-street, in the City of London, for improvements in the manufacture of artificial marble and stone, and in treating marble and stone. Sealed 10th August—6 months for inrolment.

Alfred Holl, of Greenwich, in the county of Kent, engineer, for improvements in steam-engines. Sealed 12th August—6 months for inrolment.

Arnand Nicholas Frêche, merchant, residing in the City of Paris, for improvements in obtaining power. Sealed 12th August—6 months for inrolment.

Charles Cadby, of Liquorpond-street, in the county of Middlesex, piano-forte maker, for improvements in stringed musical instruments. Sealed 12th August—6 months for inrolment.

George Thompson, of Park-road, Regent's-park, in the county of Middlesex, Gent., for certain improvements in machinery and apparatus for cutting, digging, or turning-up earth, applicable to agricultural purposes. Sealed 12th August—6 months for inrolment.

Samuel John Pittar, of Church-place, Clapham, in the county of Surrey, civil engineer, for certain improvements in umbrellas and parasols. Sealed 13th August—6 months for inrolment.

Peter Claussen, of Great Charlotte-street, Blackfriars, in the county of Surrey, manufacturer, for certain improvements in bleaching, and in the preparation of materials for spinning and felting, and in yarns and felts,—being a communication. Sealed 16th August—6 months for inrolment.

William Keates, of Liverpool, merchant, for improvements in machinery for manufacturing rollers and cylinders used for calico printing, and other purposes. Sealed 16th August—6 months for inrolment.

Charles Heard Wild, of St. Martin's lane, in the county of Middlesex, civil engineer, for improvements in certain structures for retaining water. Sealed 17th August—6 months for inrolment.

Henry Holland, of Birmingham, in the county of Warwick, umbrella furniture manufacturer, for improvements in the manufacture of umbrellas and parasols. Sealed 22nd August—6 months for inrolment.

Edmee Augustin Chameroy, of Paris, for improvements in paving streets and other surfaces. Sealed 22nd August—6 months for inrolment.

Frederick Hale Thomson, of Berners-street, in the county of Middlesex, Gent., and Thomas Robert Mellish, of Portland-street, in the same county, glass-cutter, for improvements in cutting, staining, silvering, and fixing articles of glass. Sealed 22nd August—6 months for inrolment.

William Dick, of the City of Edinburgh, professor of veterinary medicine in the Edinburgh Veterinary College, for improvements in the manufacture of steel and gas. Sealed 22nd August—6 months for inrolment.

Benjamin Rotch, of Lowlands, in the county of Middlesex, Esq., for a factitious saltpetre, and a mode by which factitious saltpetre may be obtained for commercial purposes,—being a communication. Sealed 22nd August—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in refining gold,—being a communication. Sealed 22nd August—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of ships' magazines,—being a communication. Sealed 22nd August—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of ships or vessels, and in steam boilers or generators,—being a communication. Sealed 22nd August—6 months for inrolment.

Daniel Illingworth, of Bradford, in the county of York, worsted spinner, for certain improvements in machinery for preparing all descriptions of wool and hair grown upon animals, for the carding, combing, and other manufacturing processes. Sealed 22nd August—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for producing ice, and for general refrigeratory purposes,—being a communication. Sealed 22nd August—6 months for inrolment.

Duncan Bruce, of Paspebiac, in the district of Gaspé, in Canada, but at present in Liverpool, Esq., for certain improvements in

the construction of rotatory engines. Sealed 22nd August—6 months for inrolment.

Richard Prosser, of Birmingham, in the county of Warwick, civil engineer, for improvements in supplying steam boilers with water, and in clearing out the tubes of steam boilers. Sealed 22nd August—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in cutting types and other irregular figures,—being a communication. Sealed 29th August—6 months for inrolment.

George Augustus Huddart, of Brynkir, in the county of Caernarvon, Esq., for certain improvements in the manufacture of cigars, and certain improved apparatus for smoking cigars.—Sealed 29th August—6 months for inrolment.

Disclaimers and Amendments

OF PARTS OF INVENTIONS

Made under Lord Brougham's Act,—subsequent to September 1st, 1849.

Disclaimer filed 14th September, 1849, with the Clerk of the Patents for England, by Francis Hay Thomson, of Hope-street, in the City of Glasgow, in N.B., Doctor of Medicine, whereby he disclaims a part of the title of a patent granted to him on the 14th March, 1849, for "an improvement or improvements in smelting copper or other ores."

Disclaimer filed 28th September, 1849, with the Clerk of the Patents for England, by William Buckwell, of the Artificial Granite Works, Battersea, civil engineer, whereby he disclaims a part of the title of a patent granted to him on the 28th March, 1849, for "improvements in compressing or solidifying fuel and other materials."

Disclaimer filed 3rd October, 1849, with the Clerk of the Patents for England, by Henry Dunington, of Nottingham, manufacturer, whereby he disclaims a part of the title of a patent granted to him on the 3rd day of April, 1849, for "improvements in the manufacture of looped fabrics, and in the making of gloves and hat-bands."

Disclaimer filed the 24th November, 1849, with the Clerk of the Patents for England, by Andrew Crosse, of Gloucester-place, New-road, in the county of Middlesex, Esq., whereby he disclaims part of the title of a patent granted to him on the 24th May, 1849, for "improvements in tanning hides and skins, and also in dyeing fabrics and substances."

Disclaimer filed the 1st December, 1849, with the Clerk of the Patents for England, by Moses Poole, of the Patent Bill Office,

London, Gent., whereby he disclaims part of the title of a patent granted to him on the 2nd June, 1849, for "improvements in brazing, pressing, separating, cleaning, and bleaching, and in cooling or heating matters; also in pistons, valves, taps, and spring apparatus."

Disclaimer filed the 14th December, 1849, with the Clerk of the Patents for England, by Michael John Haines, of John-street, Commercial-road East, leather-pipe maker, whereby he disclaims part of the title of a patent granted to him on the 14th June, 1849, for "improvements in the manufacture of packing for steam-engine cylinders and other purposes; part of which improvements are applicable to the manufacture of water-proof fabrics and leather."

Disclaimer filed on the 27th December, 1849, with the Clerk of the Patents for England, by John Thomas Forster, of Plymouth, a Master in Her Majesty's Navy, whereby he disclaims part of the title of a patent granted to him on the 27th June, 1849, for "improvements in building ships, boats, and other vessels; and also in the manufacture of boxes, packing-cases, roofs, and other structures requiring to be waterproof."

Disclaimer filed on the 28th February, 1850, with the Clerk of the Patents for England, by Thomas Symes Prideaux, of Southampton, Gent., whereby he disclaims part of the title of a patent granted to him on the 30th August, 1849, for "improvements in puddling and other furnaces, and in steam-boilers."

Disclaimer and memorandum of alteration, filed on the 26th March, 1850, with the Clerk of the Patents for England, by Henry Henson Henson, of Hampstead, in the county of Middlesex, Gent., to a specification of a patent granted to him on the 14th June, 1849, for "certain improvements in railways, and in railway carriages."

Disclaimer and memorandum of alteration, filed on the 9th April, 1850, with the Clerk of the Patents for England, by James Morrison, of Guines, in the Republic of France, ironmaster, and James Brown, of Newbridge, in the county of Monmouth, Esq. (assignees of a patent granted on the 31st May, 1838, to Miles Berry, of Chancery-lane, in the county of Middlesex, civil engineer), to a specification of a patent granted to the said Miles Berry, for "certain improvements in the means of economising heat and fuel in furnaces or closed fireplaces."

Disclaimer filed on the 23rd April, 1850, with the Clerk of the Patents for England, by William Mill, of Newall-street, Birmingham, manufacturer, to a specification of a patent granted to him on the 29th June, 1846, for "improvements in instruments used for writing and marking, and in the construction of inkstands."

Disclaimer filed on the 2nd May, 1850, with the Clerk of the Patents for England, by William Morris, of Cold-bath-square,

in the county of Middlesex, civil engineer, whereby he disclaims part of the title of a patent granted to him on the 2nd November, 1849, for "improvements in the preparing of clay, and in the manufacture of bricks, tiles, and other articles made of clay, or brick-earth."

Disclaimer filed on the 6th May, 1850, with the Clerk of the Patents for England, by Robert William Sievier, of Upper Holloway, in the county of Middlesex, Gent., and Richard Davis, of St. Helen's-place, in the City of London, merchant, assignee of the patent granted to the said Robert William Sievier on the 12th July, 1847, for "an improved material or materials for purifying or decolorizing bodies; which material or materials may also be employed as manure or pigments, and for other like purposes."

Disclaimer filed on the 24th May, 1850, with the Clerk of the Patents for England, by William Garnett Taylor, of Burton Hall, in the county of Westmoreland, Gent., to a patent granted to him on the 24th November, 1849, for "improvements in lint, and in linting machines," whereby he disclaims part of the title thereof.

Disclaimer filed on the 29th May, 1850, with the Clerk of the Patents for England, by Richard Peyton, of Bordesley Works, Birmingham, metallic bedstead manufacturer, Jonathan Harlow, of Bordesley Works aforesaid, metallic bedstead manufacturer, and Thomas Horne, of the borough of Birmingham aforesaid, brass-founder, to a specification of a patent granted to them on the 18th May, 1847, for "improvements in the manufacture of bedsteads."

Disclaimer filed on the 10th June, 1850, with the Clerk of the Patents for England, by William Holt, of Preston-place, Bradford, in the county of York, organ builder, to a patent granted to him on the 10th December, 1849, for "improvements in the construction of the pallets or valves of organ sound-boards or wind-chests; the same being applicable to seraphines, eolophons, harmonicons, and all other musical instruments in which the tone is produced by the admission of wind supplied by bellows or other machinery to pipes, reeds, or springs, and played upon by a key-board or key-boards; and also to various other purposes connected with all the above-named musical instruments," whereby he disclaims part of the title thereof.

Disclaimer filed on the 19th July, 1850, with the Clerk of the Patents for England, by Macgregor Laird, of Birkenhead, Gent., whereby he disclaims part of the title of a patent granted to him on the 19th January, 1850, "for improvements in the construction of metallic ships or vessels, and in materials for coating the bottoms of iron ships or vessels, and in steering ships or vessels."

CELESTIAL PHENOMENA FOR SEPTEMBER, 1850.

D.	H.	M.	
1			Clock after the ☉ 0m. 6s.
—			☽ rises Morn.
—			☽ passes mer. 7h. 22m. M.
—			☽ sets 3h. 27m. A.
4	6	31	☿ in Aphelion.
	10	0	☽ in Perigee
5			Clock after the ☉ 1m. 23s.
—			☽ rises 3h. 57m. M.
—			☽ passes mer. 11h. 21m. M.
—			☽ sets 6h. 31m. A.
6	5	28	Ecliptic conj. or ● new moon
	7	42	♃ in conj. with the ☽ diff. of dec. 2. 44. S.
7	10	37	☿ in conj. with the ☽ diff. of dec. 6. 39. S.
	10	46	♂ in conj. with the ☽ diff. of dec. 4. 6. S.
	15	17	☿ in conj. with ♂ diff. of dec. 2. 35. S.
8	20	54	♀ in conj. with the ☽ diff. of dec. 6. 58. S.
10			Clock after the ☉ 3m. 3s.
—			☽ rises 10h. 31m. M.
—			☽ passes mer. 3h. 43m. A.
—			☽ sets 8h. 46m. A.
12	10	48	☿ greatest elong. 26. 36. E.
—			Occul. 29, Ophiuchi, im. 9h. 7m. em. 9h. 45m.
13	8	21	☽ in □ or first quarter.
15			Clock after the ☉ 4m. 48s.
—			☽ rises 3h. 30m. A.
—			☽ passes mer. 7h. 47m. A.
—			☽ sets Morn.
16			Occul. σ Capricorni, im. 11h. 31m. em. 12h. 34m.
	13	0	☽ in Apogee
17	20	42	Vesta in conj. with the ☉
18			Mercury R. A. 13h. 12m. dec. 11. 12. S.
—			Venus R. A. 14h. 31m. dec. 17. 13. S.
—			Mars R. A. 13h. 3m. dec. 6. 21. S.
—			Vesta, R. A., 11h. 49m. dec. 6. 16. N.
—			Juno, R.A., 14h. 9m. dec. 4. 12. S.
—			Pallas, R. A., 21h. 20m. dec. 3. 17. N.

D.	H.	M.	
18			Ceres R. A. 0h. 38m. dec. 13. 3. S.
	—		Saturn R. A. 1h. 15m. dec. 4. 59. N.
	—		Jupiter R. A. 12h. 7m. dec. 0. 21. N.
	—		Georg. R. A. 1h. 51m. dec. 10. 48. N.
	—		Mercury passes mer. 1h. 24m.
	—		Venus passes mer. 2h. 42m.
	—		Mars passes mer. 1h. 15m.
	—		Jupiter passes mer. 0h. 19m.
	—		Saturn passes mer. 13h. 24m.
	—		Georg. passes mer. 14h. 0m.
	—		Occul. *i* Aquarii, im. 10h. 54m. em. 11h. 40m.
19			Occul. 70 Aquarii, im. 7h. 20m. em. 8h. 16m.
20			Clock after the ☉ 6m. 34s.
	—		☽ rises 6h. 5m. A.
	—		☽ passes mer. 11h. 36m. A.
	—		☽ sets 4h. 10m. M.
21	0	40	Ecliptic oppo. or ○ full moon
22	13	2	♀ in Aphelion
	14	55	♄ in conj. with the ☽ diff. of dec. 2. 1. N.
	20	0	☉ enters Libra, Autumn com.
23	8	59	♅ in conj. with the ☽ diff. of dec. 4. 40. N.
24	16	52	☿ greatest hel. lat. S.
	21	5	Ceres oppo. ☉ intens. of light 0·721
25			Clock after the ☉ 8m. 18s.
	—		☽ rises 8h. 4m. A.
	—		☽ passes mer. 2h. 38m. M.
	—		☽ sets 9h. 53m. M.
	16	25	☿ stationary
	20	38	☿ in conj. with ♂ diff. of dec. 4. 20. S.
26	10	52	♃ in conj. with the ☉
	—		Occul. *a* Tauri, im. 8h. 20m. em. 9h. 8m.
28	9	53	☽ in □ or last quarter
30			Clock after the ☉ 9m. 58s.
	—		☽ rises Morn.
	—		☽ passes mer. 7h. 12m. M.
	—		☽ sets 3h. 10m. A.

The Eclipses of the Satellites of Jupiter are not visible this month, Jupiter being too near the Sun.

J. LEWTHWAITE, Rotherhithe.

THE

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No. CCXXVI.

RECENT PATENTS.

To JAMES TEMPLETON, *of Glasgow, in the Kingdom of Scotland, manufacturer, for certain improvements in manufacturing figured fabrics, principally designed for the production of carpeting.*—[Sealed 29th January, 1850.]

THIS invention of improvements in manufacturing figured fabrics, principally designed for the production of carpeting, consists in producing the pattern either on one or both sides of the fabric by means of printed weft; also in producing either the same pattern or different patterns on both sides of the fabric by means of printed weft; also in the use of printed party-colored fur or weft in the manufacture of Axminster carpets and other similar fabrics, according to the process described in the specification of Templeton and Quiglay's patent, dated July 25th, 1839. This invention is also applicable to the production of figured chenille weft, for the manufacture of chenille shawls.

The patentee remarks, that carpets, and other fabrics with patterns on the surface, have heretofore been produced by means of printed warps; and also by printing individual threads of warp, which are placed together afterwards to form a complete warp; but that such figured fabrics have not hitherto been made with printed weft,—so that the pattern may be produced by the weft-threads alone.

In printing the weft-threads, a large number (say, for example, 100 threads) are operated upon at the same time by means of the process and apparatus hereafter described; so

that by one printing operation at least 100 repeats of the same pattern of printed weft will be produced.

In Plate VII., the method adopted for printing the weft-threads, to form a pattern on the surface of the fabric when woven into cloth, is clearly shewn. The diagram, fig. 1, represents a piece of the ordinary ruled paper, upon which a portion of a pattern is drawn. Supposing this diagram to be drawn full size, and to represent the width of the intended piece, the piece of goods, when wefted with one of the 100 threads already alluded to (or a repeat of the pattern), would be six inches in width, and three inches in length, having six shoots to the inch.

The length of printed weft required to produce any particular pattern must depend entirely upon the nature and extent of the pattern, and the fineness of the fabric, or number of shoots to the inch. The weft, when printed and finished, is to be woven up, either by hand or power, in an ordinary loom,—a suitable warp or warps, according to the size of the pattern and the nature of the fabric intended to be made, being properly arranged in the loom, and prepared and spaced; and care being taken that the weft is thrown in evenly, and that the marks, which are made or printed thereon to denote where the weft is to form the selvage, should always be brought to the edge of the piece. The operation of weaving, and the mode of arranging the warps, will be hereafter more particularly described.

For printing the weft various methods may be adopted; but the following is the plan which the patentee prefers:—Having prepared the pattern or design on the ruled paper (as shewn in fig. 1), a long strip or tape of, say, three yards in length (according to the length of the intended pattern), ruled or divided transversely, to correspond with the squares of the ruled pattern or design, is provided, as shewn at fig. 2. This strip or tape being of the length of the pattern (suppose such a pattern as shewn at fig. 1,), the colors on the pattern-paper are copied on to the strip square by square, as they occur in the design. To facilitate this object, the long strip (fig. 2,) is placed beneath the pattern-paper, and the colors on the first line of the design, commencing at 1, on the left-hand side of the pattern-paper, are carefully copied on to this strip, as shewn in the diagram. At the end of each line of the design (that is, at 2, where the selvage occurs) a narrow distinctive mark is made; and when one line of the design has been transferred to the strip or tape, as shewn in fig. 2, the tape is turned round, and the second line of the pattern

(that is, from 3, to 4,) is copied on to the strip or tape, which, for this purpose, is placed in the position of the dotted lines of fig. 1,—that is, over the line of the design that has just been copied;—the black or selvage mark on the strip or tape being placed in coincidence with the selvage or edge of the pattern or design. The second line being then copied on to the strip or tape, it will appear as shewn in the diagram, fig. 3; and when this line is completed, the strip or tape is turned round again, and the next line of the design (that is, from 5, to 6,) is copied in like manner; and so on for the whole length of the strip or tape, or the whole extent of the design, which, in the present instance, following the direction of the weft, extends to the length of three yards. The colors of the whole design having thus been read off and painted on to the tape or strip, the latter may be supposed to represent the required party-colored weft-threads, the length of which, as before stated, is three yards for one repeat of the pattern,—six shoots to the inch being employed. The colored strip or tape is then laid out flat, and a number of thin strips or blocks of wood (the surfaces of which are exactly the width of the squares of the design, and are covered with felt or other suitable absorbent material) are then to be arranged in a box or frame,—the surfaces of such blocks having been previously provided with coloring matter agreeing with the color indicated on the pattern-strip or tape. This operation will, perhaps, be best understood by referring to figs. 4, and 5. Fig. 4, represents a box or frame *a, a,* with a number of coloring-blocks, suitably arranged to produce the pattern shewn in figs. 1, 2, and 3; and fig. 5, is a longitudinal sectional view of the same.

In order to arrange the coloring-blocks in the frame *a, a,* the pattern-strip is placed alongside the frame, either above or below the same, as shewn at fig. 6; the attendant or workman then takes a coloring-strip or block (one of which is shewn in perspective at fig. 7,), and, after dipping or saturating its absorbent surface in the requisite color (which is indicated in the pattern-strip), the block is placed in the frame; he then takes another block, and, after dipping its surface in another color, according to that indicated in the pattern-strip, fig. 6, the second block is placed in the frame; and so on until all the frame is filled. Occasionally there will be parts of the design which are not colored; and when these occur, the workman places a space or short block without a coloring surface. It will also occur that adjoining squares will require to receive the same color; instead, therefore, of having separate coloring-blocks all of the same color, a single block, of

the requisite width, is employed. All the blocks are pressed up close together in the frame, and are retained in their proper positions by means of the first and last blocks, the ends of which are let into grooves made near the ends of the frame, as shewn in the plan view, fig. 4. A number of these block-frames, in succession, according to the extent of the pattern, are employed; and, if thought advisable, they may be connected together by spring-catches or hooks, as shewn at *d*, in fig. 4. The coloring-blocks are, by preference, made of wood, as shewn at figs. 7, and 8; and they are furnished, on their upper face, with felted cloth, or other suitable absorbent material, to receive the color; and, on their under sides, they may have a strip of India-rubber, or other elastic material, affixed to them, to give a proper amount of elasticity, which will be found useful when the blocks are submitted to pressure, in order to print the weft-threads.

The foregoing description refers to the method of printing weft for producing a pattern on one side only of the fabric: if, however, it be desired to produce, say, for instance, the same pattern on the other side of the fabric, then a sufficient length of the weft must be allowed to each square of the design to admit of the weft being carried both up and down, so as to shew the same pattern on both sides. In order to print a sufficient length of weft to each square of the design, to form the pattern on both sides of the fabric, the squares of each line of the design are divided into two sets or series. Fig. 9, represents a piece of a design drawn upon the ordinary ruled paper, with the squares numbered 1, and 2, alternately, from end to end of the line. Now, in transferring the design from the pattern-paper to the pattern-strip or tape, the workman first takes every alternate square (say all the squares marked 1, 1,) and transfers the color of these squares to the pattern-strip or tape,—the squares 2, 2, being left for a subsequent operation. Instead, however, of coloring only one square on the pattern-strip for every square on the pattern or design, he colors two squares on the strip for every square on the pattern, as will be seen by inspecting the pattern-strip shewn at fig. 10. Having thus marked on the strip all the colors of the squares marked 1, in the first line, the strip is turned round, as in the former instance; and all the squares marked 2, at fig. 9, are then transferred to the pattern-strip, as shewn at fig. 11,—two squares on the strip being taken for every square in the design, as before. From this, it will be seen that two lengths of weft are required to complete every line of the design in the fabric,—that is, the first length

of weft will take half the number of colors and shew them on both sides of the fabric, and the other length of weft will carry the second half of the colors, which will also be shewn on both sides of the fabric, and will complete the first line of the design. The pattern-strip being completed,—that is, the entire design having been transferred thereto, the operation of arranging the coloring-blocks in the frames *a, a,* must be effected. This is done in precisely the same way as in the former instance: the coloring-blocks are, however, twice the width of those shewn at fig. 4, as will be seen on referring to figs. 12, and 13, which represent part of a frame *a, a,* with the blocks therein, and a portion of the pattern-strip placed immediately beneath it. Fig. 14, is a diagram, shewing the printed weft interwoven between the warp-threads, and the manner of producing the colored pattern on both sides of the fabric.

Figs. 15, 16, and 17, are diagrams of a somewhat different mode of producing the same pattern on both sides of the fabric. Fig. 15, represents part of a pattern, and fig. 16, is part of the long strip or tape, on to which the pattern is marked, for the purpose of facilitating the arrangement of the printing-blocks. The first line of the pattern, fig. 15, is marked on to the strip or tape, fig. 16, precisely as it occurs in the design,—that is, all the squares from 1, to 6, are transferred to the strip or tape; and, upon arriving at the end of the line, the repeat of the pattern is transferred to the strip or tape, but in an inverse manner,—that is to say, from 6, to 1. The pattern produced upon the fabric, as indicated in the sectional diagram, fig. 17, is precisely similar on both sides. The mode represented in figs. 15, 16, and 17, produces the pattern complete on both sides. The mode represented in the previous figures 9, 10, 11, 12, 13, and 14, does not produce the pattern complete on the under side; but it shews how larger blocks may be employed. In the plans represented in both sets of figures, viz., from fig. 9, to 17, inclusive, it is assumed that twelve shoots are to be used to the inch.

The above description (in reference to figs. 9, to 17,) relates exclusively to a mode of producing the same pattern on both sides of the fabric. Sometimes, however, it may be thought desirable to have different patterns on the two sides. When this is the case, two dissimilar patterns are taken, as A, and B; and, for the sake of facilitating the reading, the squares on each are numbered, say from 1, to 12; then, in order to transfer both patterns to the same strip or tape, the workman first marks on the latter all the squares in pattern A, which have

odd numbers, such as 1, 3, 5, 7, 9, and so on (care being, of course, observed, that the colors these numbers represent are marked on alternate squares); he then marks on the alternate blank squares of the strip all the squares of pattern B, which have even numbers,—that is, 2, 4, 6, 8; and, in returning, he takes all the even numbers of A, and the odd numbers of B, which will complete one line of each pattern, as shewn in the diagram, fig. 18, and also in the sectional diagram, fig. 19.

The frames *a, a,* being thus furnished with the coloring-blocks, suitably arranged, and duly supplied with the proper colors, according to the pattern to be produced, it only remains to shew the manner in which pressure is applied to the blocks, in order to transfer or print the colors on to the weft.

Fig. 22, is a plan view of an arrangement in which the block-frames are placed on a flat table, and pressure is given by means of a platten or flat surface; and fig. 23, is a longitudinal vertical section of the same. The block-frames *a, a,* before described, when properly filled, are placed by attendants on the wooden table *b, b;* from whence they are pushed forward, in succession, on to the strong metal table *c, c,* of the press. The weft-threads or yarns *d,* to be printed, are wound on a beam or roller *e,* which is mounted in bearings in the standards at the head of the apparatus. From this beam or roller, which is properly weighted, the weft-threads or yarns pass over a small breast-roller *e**, and between the teeth of a comb *f,* to the printing table *c, c.* The platten or printing surface *g,* is worked vertically, by means of a screw, or lever, or other suitable mechanical contrivance. In order to keep the printing surface of the platten (covered beneath with printing blanket) from coming into contact with the wet coloring surfaces of the blocks, it is protected by a waxed cloth or other impervious travelling-cloth or fabric *h, h,* which is wound on the upper weighted-roller or cylinder *i, i,*—also mounted in the upright standards. The length of the travelling-cloth corresponds to that of the weft or yarn to be printed; and it is caused, by means of suitable gearing, to travel forward with the latter. From the press the printed weft or yarn passes with the waxed cloth into a drying-chamber or stove *j, j, j,* where, by means of steam or hot air, the colors printed on the yarns *d,* are dried; and, after passing over a roller *k,* (or a series of rollers, if thought necessary) the colored weft issues from the chamber *j, j,* in a dry state, and is then wound on to a beam or roller *l.* The waxed or

impervious cloth, after passing round a roller *m*, in the drying-chamber, issues therefrom, and is wound on to another beam or roller *o*, above. It will be seen that the beam *o*, which receives the waxed or impervious cloth, and also the beam or roller *l*, which receives the dried colored weft, are mounted in standards outside the drying-chamber; and on the axles of these rollers are toothed-wheels of similar pitch, which gear into each other, and cause the rollers to revolve at the same speed. The lower roller is also furnished with a ratchet-wheel and pall, to prevent it from rotating in the wrong direction. The operation of the machine is as follows:—The block-frames *a*, *a*, filled with colored blocks, having been properly placed on the printing table *c*, *c*, the platten is brought down, and pressure communicated to the blocks, which impart their colors to the weft-threads or yarns. This having been done, motion is communicated to the winch-handle *n*, which, by means of the pinion *p*, (shewn by dots in fig. 23), actuates the toothed-wheels on the axles of the rollers *l*, and *o*, and consequently draws forward a certain length of the printed yarns, and a corresponding length of the waxed cloth; at the same time, those blocks which have been printed from are moved from the printing table *c*, on to the adjoining table *g*; fresh blocks are then put in, and the operation of printing again takes place; and so on, until the whole length is completed. To prevent the undried colored yarns from staining the roller *k*, an additional waxed cloth *r*, (fig. 23,) is used to protect its surface. This waxed cloth is wound round a roller *s*, which is mounted in standards in the drying-chamber; and as the colored yarns are, by the operation of the winch *n*, drawn forward on to the cylinder or roller *k*, the waxed cloth is unwound from the roller *s*, and drawn in with it; and, after passing round the roller *k*, it is wound upon a receiving-roller *t*, which is caused to revolve by being held in contact with the under side of the roller *s*, by means of a weighted cord *u*.

Fig. 24, is a longitudinal vertical section of another arrangement of apparatus for printing the weft threads or yarns. In this instance, the block-frames *a*, *a*, are placed upon a travelling endless table or cloth *b*, *b*, which passes over two end-rollers *w*, *w*, and is further supported by rollers *v*, *v*, *v*. A strong bed-roller *c*, made of metal, or other suitable material, capable of sustaining great pressure, is mounted in bearings in the framing; and immediately above the bed-roller *c*, is mounted the impression-cylinder *g*, which is covered with blanket, or some other suitable material. The weft-threads or yarns *d*, to be printed or colored, are, as in the former

instance, wound on a beam or roller *e*, mounted in bearings in the end standards. A waxed cloth or other waterproof travelling-surface *h*, is also wound on to a roller *i*, and travels with the weft-threads or yarns to be printed or colored, in order to prevent the wet color-blocks or yarns from soiling the printing surface of the roller *g*.

The patentee also shews an arrangement of apparatus whereby the block-frames *a, a*, are dispensed with. The long and narrow coloring-blocks are fixed in or adapted to a large printing-cylinder, by means of notches or grooves, into which the ends of the coloring-blocks fit.

The operation of printing with this apparatus is as follows:—The large cylinder is mounted horizontally in bearings, in a suitable framing, as shewn in the sectional view, fig. 25; and an impression-cylinder is also mounted in suitable bearings immediately above the large cylinder.

The yarns or threads *d*, to be printed, and also a waxed or waterproof cloth, are passed between these two rollers; and the color is transferred from the blocks to the weft-threads or yarns, as in the former instances. After the blocks have passed under the impression-cylinder, and printed the colors on to the yarn, they are either allowed to fall out of, or are removed from, their grooves, in order to receive an additional and fresh supply of color; after which, they are fixed in their places again; and, by the continuous but slow rotation of the large cylinder, the pattern will be repeated on the yarns from end to end.

The foregoing description applies to the production of a pattern on one or two sides of a fabric, by printing individual weft-threads, and afterwards weaving them into a fabric. Another improvement consists in producing a pattern on an Axminster carpet, or cut-pile fabric, by printing a texture which is afterwards cut up into weft.

Patent Axminster carpeting, or figured chenille shawls, are made by first weaving a texture of woollen, cotton, silk, flax, or other fibrous materials, composed of weft-threads of divers colors.

The warp-threads of this texture are spaced or set in the reed at certain equal distances from each other: one or more splits of the reed are filled, each with three threads, to form Turkey-gauze or cross-weaving, which binds the weft-threads when thrown in; then a space of the reeds, or a number of the reed splits, are left empty (according to the depth, thickness, or fineness of the fabric to be afterwards woven); then another split or splits are filled; then again so many are left

empty; and the same is repeated until the required breadth is obtained. The weft, previously dyed in the hank, of various colors, according to the pattern intended, is then thrown into this warp, so spaced, and is operated on by Turkey-gauze mounting.

The patentee proposes to furnish the reed with warp in the same way; but instead of employing a variety of colored wefts, he throws in a white weft, or a weft of one uniform color; which, after being woven into the warp, so as to form a texture, is printed across the texture, with divers colors, according to the intended pattern, and in a similar manner to the process already described for printing weft-threads. By this means a colored texture, suitable for producing the wefts used in the manufacture of patent Axminster carpeting, or figured chenille shawls, is produced, and only requires to be afterwards cut up into strips between the splits of warp, and thereby formed into a cut-pile weft; which may then be woven in the usual manner, to form the cut-pile fabrics before mentioned. In this way a fabric—which, for the sake of distinction, may be called a printed party-colored weft texture—is produced.

The manner in which the printed weft-thread is woven up into cloth, so as to bring the pattern weft to the surface, is as follows:—As the pattern, on the surface of the fabric, is to be produced by the weft, it will be found desirable, when the pattern is only on one surface, to employ two separate warps, and also a binding weft, as well as a pattern weft, to make the fabric strong, and hold it together. One of the warps, having two threads in the split, forms a ground warp for holding in the pattern weft-threads; and the other is a thick and heavy dead warp, having one thread in a split, and is intended to throw up the pattern weft. The pattern weft is made always to pass over this last warp, which, by its thickness, will give a good body to the finished fabric. The ground weft, of flax or any other material, is made to pass under the heavy warp, for the purpose of binding it in the fabric. A diagram of this mode of employing two warps (viz., a ground warp, or one for holding in the pattern weft-threads or stripes, and a thick heavy warp for giving a body to the fabric) and also two weft-threads or stripes (viz., one to produce the pattern on the surface, and one to bind the fabric together beneath) is given at figs. 20, and 21, and will be understood by the practical weaver, without further explanation. Diagrams 17, and 19, shew the weaving where a pattern is on both sides, and one description of warp only is used.

The patentee, in conclusion, remarks, that he is aware of

patterns on carpets and other similar fabrics having, before the date of his invention, been produced by means of printed warps, and also by party-colored chenille; he does not therefore intend to claim such methods of producing a colored pattern on the surface of carpet fabrics, as constituting any part of the present invention; nor does he claim the exclusive use of the apparatus and arrangements hereinbefore described, except when the same are employed for the purposes of the invention. He claims, First,—the manufacture of carpeting and figured fabrics with a pattern or design on one or both sides, by means of printed weft-threads, as above described; and also the manufacture of carpeting and figured fabrics, by means of a party-colored cut-pile weft from a plain cloth or texture of one color and printed with different colors, as above described.—[*Inrolled July,* 1850]

To Joe Sidebottom, *of Pendlebury, in the county of Lancaster, manager, for certain improvements in steam-engines.*—[Sealed 3rd January, 1850.]

This invention consists in the application of certain apparatus, in connection with the "governor" (or other such instrument, acting by centrifugal force), by which the motion of the engine may be speedily and securely arrested, and the damage which frequently occurs to machinery, from a sudden alteration in the velocity of the first mover, avoided. The invention also consists in apparatus, connected with the governor (or other such instrument, acting by centrifugal force), intended to give notice to the engineer when an undue increase or decrease in the speed of the engine shall have taken place. The method for arresting the motion of the engine consists in so arranging the connection of the governor (or other such instrument, as aforesaid) with the throttle-valve of the engine, or with certain other valves in connection therewith, that, upon the engine having exceeded or fallen below the desired velocity, the said throttle-valve shall be wholly or in part closed, independently of the ordinary action of the governor, or other like instrument;—the same apparatus also being used for the purpose of checking the engine, by the admission of air into the air-pump of low-pressure engines, and also by the admission of steam into the working cylinder, by means of the blow-valve, or other passage suitable for effecting the object.

In Plate VIII., fig. 1, is an elevation of part of a steam-engine, shewing the improvements as applied to arresting the

motion of the engine upon an undue velocity having been attained; and fig. 2, is a detached view, partly in section, of some of the novel parts, as they would appear when looking towards the right-hand side of fig. 1. The governor A, is connected, in the ordinary manner, to rods and cranks *a, a, a.* The rod *b, b,* instead of being in direct communication with the lever of the throttle-valve, passes through a tube *c, c,* but is secured at pleasure, so as to move therewith, by means of a tightening screw *d,* affixed to a pulley *e.* To this pulley one end of a chain *f,* is attached,—the other end being fixed to a short tube *g,* which is capable of being moved vertically upon a fixed rail *h,* and is retained in any required position thereon by a tightening screw *i.* To the tube *c,* is jointed one end of a lever *j,*—the other end thereof being mounted upon a short shaft *k,* capable of vibrating in bearings, attached to any convenient part of the engine; and to the short shaft *k,* is also affixed a lever *l,* the outward end of which is attached to a rod *m,* in connection with the throttle-valve of the engine. By this arrangement, and the various parts being as described, the governor, in its ordinary operation, will, through the intervention of the rods and cranks *a, b,* cause the tube *c,* to move up or down, and rock the short shaft *k,* and thereby, through the intervention of the lever *l,* and rod *m,* regulate the position of the throttle-valve. But, if the engine shall have attained a velocity above that at which it is intended to move, then the increased action of the governor will have caused the tube *c, c,* to descend so far that the chain *f,* will become distended, and the further descent of the tube will cause the said chain to unwind from the pulley *e,* and, in so doing, turn it round and loosen the screw *d.* The tube *c, c,* will then be capable of motion, independently of the rod *b,* and will fall by its own gravity, turning the short shaft *k,* upon its centre; which motion will, by means of the lever *l,* and rod *m,* close the throttle-valve, and thus arrest the motion of the engine. If desired, however, a stop may be placed in any convenient position, so as to prevent the tube *c,* and its appendages, from falling sufficiently far to entirely close the throttle-valve. The velocity at which the engine shall move, before the tube *c,* falls, is determined by changing the position of the short tube *g,* upon the rail *h*; that is to say, by altering the arrangement of the chain *f,* so as to allow it to become distended and turn the tightening screw *d,* sooner or later, as desired. The patentee remarks that, if found necessary, the tube *c, c,* may be weighted, so as to insure a quicker descent thereof.

Figs. 3, and 4, shew, upon a larger scale, a modification of the improvements. In this instance, the rod *b*, (in connection with the rods and cranks *a*, *a*, as before described) moves in a guide formed in a bracket *n*, extending from any convenient part of the engine, and carries a bell-crank *o*, *o*, which turns freely upon a centre-pin. One arm of the bell-crank lever *o*, *o*, is jointed to a bolt *p*, which moves in a guide attached to the rod *b*, which bolt, during the ordinary action of the apparatus, projects under a pin *q*, attached to the lever *l*,—such pin moving in a slot formed in the rod *b*. The other arm of the bell-crank lever is connected to a rod *r*, which moves in a slot formed in the bracket *n*, and carries, towards its lower end, an adjustable stop-piece *s*. By this arrangement, and the various parts being in the position shewn in fig. 3, the whole apparatus will move together according to the ordinary operation of the governor; but, upon the engine having attained a speed above that determined upon, the adjustable stop *s*, will be brought in contact with the fixed bracket *n*, and the rod *r*, will be arrested in its descent. The bell-crank lever *o*, will thereby be made to rock on its centre-pin, and withdraw the bolt *p*, from under the pin *q*; the lever *l*, will then turn upon the short shaft *k*, and carry down with it the throttle-valve rod *m*, into the position shewn in fig. 4, and thus prevent a further admission of steam to the cylinder: or by placing a stop, as before mentioned, the throttle-valve may be but partially closed. In order to allow the pin *q*, to fall through the slot *q**, the guide in the bracket *n*, must be so formed as to allow the rod *b*, to vibrate sufficiently therein.

Fig. 5, shews, in a detached partial view, an arrangement of apparatus similar to that first described, but suited to come into operation when the engine is moving too slowly, as well as at the time when the velocity is too high. This apparatus is intended chiefly to be applied to engines which are driving machinery, the rate of working of which is of much importance, and where it is better that the operation of the machinery should entirely cease rather than proceed at a greatly diminished rate. The action of this apparatus is precisely similar to that already described, excepting that two chains *f*, *f**, are attached to the pulley *e*,—the one *f*, being designed to loosen the screw *d*, as before mentioned, and the other *f**, to perform the same office when the engine shall have slackened too much in speed, and the tube *c*, have, consequently, ascended beyond a certain point. In describing this apparatus, it has been mentioned as being placed in connection with the ordinary throttle-valve; it will be evident, however, that the

rod *m, m,* may be connected to a valve, which shall admit air to the condenser of a steam-engine, in order to arrest the motion thereof; and also that, if desired, it may, for the like purpose, operate upon the ordinary blow-valve, or other similar contrivance for admitting steam into the working cylinder.

The second part of the invention, which consists of an apparatus for giving notice to the engineer of an undue increase or decrease in the speed of the engine, is shewn in the drawing (for convenience sake), in conjunction with the other improvements; it will be obvious, however, that it may, if desired, be used alone. The bell-crank rod *a, a,* fig. 1, is bent down into the form shewn at *a**, *a**, *a**, and is provided with adjustable tappets *t, t,* which act, at certain times, against levers *u, u,* extending from an ordinary spring-box, such as is used in the hanging of house-bells. From this spring-box a wire *v,* extends, in the ordinary manner of such apparatus, and may be conveyed to any required situation at which it is desired to place the bell. Upon the engine acquiring an undue velocity, one of the adjustable tappets *t, t,* will pass its corresponding lever *u,* and turn the said lever upon its centre of motion, and thereby ring the bell. The same effect will also take place by the backward action of the other tappet upon its corresponding lever, when the speed of the engine shall have fallen below the determined speed. The tappets *t, t,* are adjustable upon the rod *a, a**;—the rate of speed therefore allowed to the engine, without giving an alarm, may be readily governed by shifting them upon the rod *a, a**. Instead of being connected with a bell, the wire *v, v,* may be caused to operate, by means of a suitable connection, so as to give notice by a steam-whistle or other such alarm.

The patentee claims connecting the governor of steam-engines (or other like instrument, acting by centrifugal force), with a throttle-valve, so that, upon an undue velocity being attained, the action of the said governor (or other such instrument) shall immediately cause the steam-passage to be partly or wholly closed, beyond the control of the ordinary operation of the governor or other such instrument. Also the use of the like apparatus for the purpose of checking or stopping the engine, by admitting air into the condenser, or by introducing steam into the working cylinder, through the blow-valve or other similar passage. And further, the application of the ordinary motion of the governor, or other such instrument, to the purpose of ringing a bell, or of otherwise giving an alarm, upon an undue velocity of the engine taking place.—[*Inrolled July,* 1850.]

To John Goodier, *of Mode Wheel Mills, near Manchester, in the county of Lancaster, Miller, for certain improvements in mills for grinding wheat and other grain.*—[Sealed 9th July, 1849.]

These improvements in mills for grinding wheat and other grain, relate, firstly, to an improved mode of balancing the upper stone or runner, so as to avoid the rubbing of one stone against the other in the operation of grinding, and thereby materially to lessen the friction which takes place in the ordinary mode of mounting mill-stones.

In Plate VII., fig. 1, is a top or horizontal view of a pair of mill-stones, with the improvements applied; fig. 2, is a section taken vertically through the stones, in the line *a, b*,—the driving apparatus being shewn complete; fig. 3, is a similar section taken in the line *c, d*; and fig 4, is a top horizontal view of the bed-stone and balancing apparatus of the runner. A bed-stone, of the ordinary construction, is shewn at *a, a*, through which the driving-spindle *b*, mounted in the usual bushes, is passed. The upper part of the driving-spindle is formed as a cone,—the extremity thereof being rounded, in order to carry the gimbles upon which the running stone is mounted. A socket, *c, c*, is fitted loosely on the conical upper part of the driving-spindle *b*, but is caused to revolve therewith by means of a feather or key, fitted to the spindle, and projecting into a groove formed in the socket *c*. On either side of the socket *c*, arms *d, d*, project upwards, which arms are connected by means of pins *e, e*, to projecting pieces extending from a boss *f*, which rests, by means of a recess formed therein, upon the upper extremity of the driving-spindle *b*. Pendent from the boss *f*, are arms *g, g*, which are turned at right angles at their lower extremities, and fit into grooves formed in the under part of the running mill-stone *h, h*, at *i, i*:—by these means, the driving-spindle being put into motion by any convenient agency, the socket *c*, is caused to revolve, carrying with it, by means of the connecting pins *e, e*, the boss *f*, and, consequently, the stone *h, h*. The pins *e, e*, which connect the arms *d, d*, to the boss *f*, are fitted into sockets, and retained therein by means of keys, as shewn in the drawing; the sockets, however, are formed sufficiently large to allow the pins *e, e*, to play slightly therein; the effect of which will be, that as the runner, by the means above described, is caused to revolve, it will rock slightly upon the rounded extremity of the driving-spindle *b*, and thereby avoid the friction which would take place if the stone were

firmly attached to the driving-spindle. In order to keep the stones cool during the operation of grinding, the patentee causes a current or currents of air to pass through the eye of the runner. This may be effected in various ways; but the means which he prefers is as follows:—Upon the upper surface of the runner *h, h,* there are attached two curved tubes or passages *k, k,* which diminish in area as they near the centre of the stone, and the extremities thereof extend downwards through the eye of the runner, as shewn in the drawing; the effect of which will be, that as the runner revolves, a current of air will be caused to rush through each of the said passages, and, making its exit at the bottom thereof, will be distributed over the surface of the stones and effect the required cooling.

The patentee claims the mode, above described, of balancing the runner mill-stone, so as to allow a slight oscillation during the action of grinding; and, in combination with the said mode of balancing the stone, he claims the application of a current or currents of air passed down the eye of the runner—such current or currents of air being either conducted by the agency of tubes, revolving with the runner, or by means of fans or blowers of any suitable construction, capable, in such combination, of effecting the desired object.—[*Inrolled January,* 1850.]

To THOMAS WHALEY, *of Chorley, in the county of Lancaster, coal proprietor, and* RICHARD ASHTON LIGHTOLLER, *of the same place, cotton-spinner, for their invention of certain improvements in machinery or apparatus for manufacturing bricks and tiles from clay or other plastic materials.*—[Sealed 3rd May, 1849.]

THIS invention applies to the manufacture of all kinds of bricks, tiles, quarries, pipes, and other similar articles, and consists principally in combining the "pug" mill, pressing-cylinder, screens, and die-plate, in one machine; thereby effecting a great economy in time and labour, and also in the cost of the machinery itself.

In Plate IX., fig. 1, is a side elevation of the improved machinery for manufacturing bricks; fig. 2, is a plan view of the same, with the "pugging" cylinder removed; and fig. 3, is a front elevation, shewing more distinctly the die-plate, and the method of working the screens. Fig. 4, is a section of the improved apparatus, shewing also the carriages for removing the bricks; and fig. 5, is a plan view of the carriages.

a, a, is the cylinder of the pug-mill; *b, b,* are the knives, constructed and wrought in the ordinary manner; and *c,* is an opening in the bottom of the pug-mill, through which the clay falls into the pressing-cylinder *d.* The pressing-cylinder *d,* is furnished with a piston *e,* which is suitably packed by means of segments *f, f,* acted upon by set-screws *g, g.* A sliding-door *h,* is attached to the piston *e, e,* for the purpose of opening and closing the aperture *c,* as occasion may require. The sliding-door *h,* is kept clean by means of a scraper 1, which is pressed against it by the weighted levers 2, 2, one at each side of the machine. *i, i,* is a toothed rack, attached to the piston *e,* and wrought by means of a spur-pinion *k.* This pinion *k,* is keyed upon the shaft *l,* to which an alternating rotary motion is communicated by means of a mangle-wheel, or other suitable contrivance. *m,* is a double screen, the bars of which are placed vertically, and which has a division in the centre the same depth as the outside frame. This screen *m,* is fixed in a sliding frame, and is capable of being slidden backwards and forwards by means of the screw *n,* working in a bush *o,* being wrought by means of the winch-handle *p.* *q,* is a fixed screen, provided with horizontal bars: it is required for very fine work only, and when not employed a blank frame is inserted in its stead. *r, r,* is an inclined trough or mouthpiece; and *s, s,* is the die-plate. *t, t,* are two parallel rails, which, if preferred, may be slightly inclined from the mouthpiece; and upon these the flanged wheels *u, u,* of the carriages *v, v,* run. These carriages *v, v,* are connected by links *w, w,* and are each furnished with a loose board *x, x,* upon which the bricks are removed.

The operation of the machine is as follows:—Supposing the piston *e,* to be in its furthest position from the screens, and the apertures *c,* consequently open, the action of the knives *b, b,* will force the clay from the pugging-cylinder *a, a,* through the opening *c,* into the pressing-cylinder *d.* As the piston *e,* advances, the sliding-door *h,* attached thereto, gradually closes the opening *c*; and, when closed, the pressure of the piston *e,* will force the clay through the screens *m,* and *q,* and through the openings *y, y,* in the die-plate *s,* in three parallel bars, the depth and thickness of the intended brick. These bars of clay will be deposited upon the carriages *v, v*; and as they advance, the carriages will advance with them,—the carriages keeping at the same relative distances from each other as shewn in the drawing,—that is, as near as the collars upon the links *w, w,* will allow; the carriages being all held together by means of the rod *z, z,* which is attached to the

last and first carriages. As soon as the piston has completed its stroke, it commences to recede; the bars of clay may then be severed between each carriage by wires; and each carriage will then contain three or more bricks, of the length, breadth, and depth required. The rods *z, z,* must then be pushed in the direction of the arrow, which will have the effect of separating each carriage as far as the cotters of the links *w, w,* will allow; and the loose boards or slates *x,x,* containing the bricks, may then be removed therefrom, and placed in racks to dry. When fresh boards are placed upon the carriages, they must be pushed back into their original position, ready for the next discharge of bricks. As the clay passes through the screens *m,* and *q,* any stones or lumps, &c., which may have entered the pressing-cylinder, will be deposited at the back of the screens; and as soon as the piston has completed one or two strokes, according to the nature of the clay and the quality of the work, the winch-handle *p,* must be turned, to slide the double-screen *m, m,* into the reverse position, and bring that half of the screen outside the cylinder which was before exposed to the action of the clay,—substituting the other part of the said screen in its stead. The screen *m, m,* being recessed upon both sides, will clean the surface of the screen *q, q,* and bring with it a stratum of clay upon each side, containing the stones, lumps, or other extraneous matter which may have been there deposited. This half of the screen having been cleared by hand, the screen is ready to be slidden back into its original position; when the other half of the screen may be cleared in like manner. It will be evident that, if preferred, the screen may be readily moved by self-acting means, instead of by hand.

When it is desired to make tiles, pipes, or other similar articles, by this machine, it is only necessary to remove the die-plate *s,* and substitute one of suitable form in its stead.

The patentees claim, Firstly,—the combination of the pug-mill and pressing-cylinder, or of the pug-mill, pressing-cylinder, screens, and die-plate, in one machine. Secondly,—the construction and application of the double sliding-screen *m,* together with the method of cleaning the same, without removing it from the machine. Thirdly,—the application and use of the second screen *q,* having the bars placed at right angles to the former one. And, Fourthly,—the general construction and arrangement of the carriages for removing the bricks.—[*Inrolled November,* 1849.]

To Ebenezer G. Pomeroy, *of Cincinnati, in the county of Hamilton and State of Ohio, United States of America, chemist, for a new and useful process of coating iron and other metals with copper and other metallic substances.*— [Sealed 7th March, 1850.]

This invention of a new and useful process of coating iron and other metals with copper and other metallic substances will be clearly understood from the following description thereof:—

Process No. 1.—Immerse the iron (no matter as to its shape or form) in dilute sulphuric acid, for the purpose of cleansing the surface of the article which is to be coated; and when thus cleansed, submit the iron to a brisk heat, to dry it. When dry, immerse the article in a mixture of clay and water, say a thin pulp,—a sufficient amount of clay being held in suspension in the water to leave a thin coating on the surface of the article so immersed. Then dry the iron again over a brisk fire, as before, and it will be in a proper condition for the next process.

Process No. 2.—In order to carry out this process, a suitable bath of melted metal (copper or its alloys) is provided, of a sufficient depth to cover the article or articles to be coated. This bath is set over a furnace, or so arranged as to be capable of retaining the copper at a fluid state. The temperature to which the copper is to be brought, to form a union with the iron, admits of a large range; for, if the copper be rendered fluid, it will unite with great facility with the iron. The length of time requisite for the iron and copper to form a union will be according to the thickness of the article under operation; for instance, sheet-iron will not bear to remain in the bath longer than a few seconds, and for this reason:—so soon as it has become impregnated with the melted metal in the bath, it becomes "hot-short," and will break by its own weight; but if it is carefully handled, it will, as soon as it has cooled, become tough; it may then be passed between rollers as often as it is necessary, to reduce it to the desired thickness. The result of this annealing process will be a smooth surface, fully equal to the brightness of pure copper or brass.

The time required to coat the iron will generally be proportioned to the massiveness of the piece,—that is, it will depend on the time necessary to bring up the temperature of the iron to the point of alloying with copper. When in a

fluid state, the copper is in a condition to commence coating clean iron, and will do so if the piece of iron be not so large as to reduce the copper around it to the pasty or solid form. If the heat of the copper be much above the bare melting point, thick pieces of iron will be the sooner raised to the required temperature and coated with the copper. In the first dipping, the iron should remain in the bath so long as it will bear it without becoming hot-short; for the more the copper penetrates the iron (upon the first dip) the greater will be its toughness and strength; and if it be desired to increase the thickness of the coating, the dips may follow in quick succession. This will of course increase the coating upon the surface.

The usefulness of clay as a coating to defend the surface of the iron from oxidation, after it has been cleansed, depends, in part, upon the union formed between the ammonia, generally found in clays, and the residual sulphuric acid of the first or cleansing process: the property of the acid, to act slowly upon the iron, is then destroyed or neutralized by the ammonia in the clay; while the clay itself mechanically protects the surface of the iron from the action of the air.

To be effectually defended by the copper, the iron ought to be thoroughly coated; since, if any point of iron be left exposed, it will be corroded only the more rapidly on account of its being in contact with the less oxidizable metal, which, in relation to it, acts as an electro-negative body, just as iron, imperfectly tinned, is found to corrode faster at the naked parts than if no tin had been applied to any part of it.

The patentee remarks, that this copper-coated iron will be found useful for many purposes and appliances. It will be found useful in the sheathing of vessels, in the roofing of houses, and in marine steam-boilers. The saving will be great in employing it as fastenings for ships; inasmuch as a spike made of iron is much stronger than one made of copper; but when covered by this process with copper, the action of the gallic acid of the wood upon the iron will be prevented.

The patentee claims, First,—the before-described process of coating and impregnating iron, or other similar metals, in all useful shapes and forms, with copper, or any alloy of which copper forms a part,—the said process consisting of cleansing the iron or other metal with sulphuric or other acid; defending the cleansed surface with a coating of clay or other aluminous earth; drying the same; and then plunging the article, thus coated, into melted copper, or an alloy of that metal. Secondly,—the use of the clay-paste to protect the metal

from oxidation during the process of alloying or coating the metal plates or pieces of metal, as above set forth.—[*Inrolled September*, 1850.]

To GEORGE TOSCO PEPPE, *of Great Marylebone-street, in the county of Middlesex, civil engineer, for improvements in time-keepers.*—[Sealed 28th February, 1850.]

THIS invention consists in effecting the mensuration of time by the descent of a column of mercury contained in a glass tube, by causing its rate of motion to depend upon the passing of the air from beneath the mercury, through a regulated orifice, to the portion of the tube above the mercury.

In Plate IX., fig. 1, is an elevation, and fig. 2, a transverse section of one of the improved time-keepers. It is formed by taking a clean glass tube *a*, (fig. 3,) three feet long, or of any other convenient length, about $\frac{3}{8}$ths of an inch in diameter, with a bore of from $\frac{1}{16}$th to $\frac{1}{8}$th of an inch in diameter, and marking the following divisions upon it:—*b*, equidistant from the two extremities a^1, a^2, of the tube; *c*, equidistant from a^1, and *b*; and *d*, *e*, each about three inches distant from *c*. The parts *d*, *e*, are fused by the flame of a blow-pipe until the bore of the tube is slightly contracted at those parts; and then, by means of a covered wire, two pieces of porous wood, about $\frac{3}{8}$ths of an inch long, are introduced into these contracted parts and fixed therein sufficiently tight to prevent the passage of mercury. By means of the blow-pipe the tube is fused at the part *c*, until the diameter of the bore is reduced to $\frac{1}{2500}$ths of an inch or thereabouts. A column of mercury, about one inch long, is introduced into the tube, which is then bent at the point *b*, and the two ends of the tube are fused together; so that the tube will present the appearance represented at fig. 1;—the mercury being situated at *f*. The mercury is sustained in the tube partly by the air within the same, and partly by capillary attraction; and as the pieces of wood at *d*, *e*, although impervious to mercury, are pervious to air, the latter will percolate slowly through the wood and through the contracted parts *c*, of the tube; and the time occupied by the descent of the column of mercury through any given space will depend upon the size of the aperture *c*, which is to be determined by repeated trials. In order to prevent the mercury from oxidizing and coating the inside of the tube *a*, a small tube is drawn out at *g*, and through it is introduced a drop of concentrated sulphuric

acid or purified oil, which lubricates the inside of the tube; and then the tube *g*, is hermetically sealed, so as to prevent any change in the external atmosphere from affecting the action of the instrument. For the same purpose (viz., preventing the mercury from oxidizing), the tube *a*, may be filled with nitrogen or hydrogen gas, instead of air. *h*, is a graduated cylinder of wood or white glass, secured to the tube *a*, by the bent strips of metal or clips *i*, *i*, in such manner as to permit of it being slidden upwards or downwards for the purpose of adjustment. The cylinder is graduated or divided into hours or other portions of time (as shewn at fig. 1, and fig. 4,);—the several divisions being determined by observing the distance which the mercury descends in given intervals of time, as indicated by a chronometer. When the instrument is in use for measuring time, it is suspended in a vertical position; and the exact time that has elapsed may be ascertained from it, by referring to the graduated cylinder at the part to which the mercury has descended. On the mercury arriving at the lower part of the instrument, the latter is to be reversed; and the mercury will then descend through the same leg of the tube as before, but in the reverse direction. As the mercury thus moves alternately in opposite directions, it is requisite to have both sides of the cylinder *h*, graduated—the numbers running in reverse directions; and the graduations on each side of the cylinder should extend (say two or three hours) beyond the point at which the inversion of the instrument may take place (say, for example, at the expiration of every period of twelve hours); so that it will not be necessary to invert the instrument precisely at the completion of the same period of time; but when the instrument is inverted, the graduated cylinder must be adjusted to the time that has elapsed since the completion of that period, by sliding it in the clips *i*, *i*. It is stated that the instrument may be adapted for measuring a long period of time, such as a month or year, by reducing the column of mercury and the size of the aperture *c*.

The patentee claims the method of regulating the descent of a column of mercury, contained in a glass tube, by causing its rate of motion to depend on the air beneath the mercury in the tube passing by a regulated orifice to the portion of the tube above the mercury; and the application of this regulated motion to indicate equal portions of time.—[*Inrolled August*, 1850.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for an invention of improvements in the manufacture of knobs for doors, articles of furniture, or other purposes; and in connecting metallic attachments to articles made of glass or other analogous material,—being a communication from abroad.*—[Sealed 27th September, 1849.]

This invention consists in forming an attachment between metals and minerals, whereby an appreciable disturbance of the crystallization of the mineral is avoided, in consequence of the attenuated form given to the metal. The invention is especially applicable to manufacturing door-knobs, furniture-knobs, door-plates, curtain-pins, seal-handles, table-feet, banister-heads, caps for pillars of steam and other machinery; also as balance-weights for clamps, clocks, scales, or other such matters; likewise as handles for tools, such as braces, &c., or winch-handles; as bulbs and fountains for smoking-pipes, insulators for lightning-rods, ornaments for holding curtain-rods, ornaments for gas-jets, handles for electrical dischargers, mineral bells, caps for tongs, fire-irons, fenders, mineral ladles, bell-pulls, covers for mugs, dishes, vases, rummers, caps for wheel-hubs, letters for signs, and other like articles.

The invention consists in inserting metallic shanks into the mineral mass (be the purpose what it may for which the article, when manufactured, is intended); which shanks are either tubular or composed of diverging flanges, and are made out of the smallest amount of metal consistent with the strength required in the article. By the employment of these shanks the difference between the natural expansion of the metals and minerals combined is diminished in its dangerous tendency; and thus an undue strain between the mineral and metal, during the annealing process, is avoided. The strength of the attachment can therefore be readily perceived by persons skilled in mineral manufactures, by considering how very large a surface, in proportion to the amount of materials used, is thus brought into serviceable contact and adhesion, unimpaired by difficulties in manipulation hitherto never overcome.

In Plate VIII., fig. 1, represents a mineral door-knob, with the shell of the mounting in position for being fitted; fig. 2, is a section of a knob, shewing the mineral bulk, the metallic shank, the mounting, and fitting; figs. 3, are different forms of tubular metallic shanks; fig. 4, is a sectional view, representing the mode of attaching a pair of knobs, with tubular

shanks, the one to the other,—the shanks being made the one to receive the other, and thus constitute a spindle; and fig. 5, shews the mode of attaching a tubular-shanked knob to a door or piece of furniture. The shank is screwed into the door or piece of furniture by means of a thread cut thereon; and the knob is further secured by inserting a wood screw into the shank from the other side of the door or piece of furniture,—a thread being cut in the inside of the hollow shank for that purpose. When a permanent knob is required on each side of a door, another knob, with a male screw on the end, can be substituted for the wood screw.

Fig. 6, is a perspective view, partly sectional, of a pair of knobs with shanks consisting of diverging flanges, shewing the escutcheon in section, and the mode of grooving and perforating the shanks, for the purpose of fastening them together. Fig. 7, represents the face of the escutcheon next the door, with the depression in the escutcheon for dropping the staple into its place, and the manner in which the wire staple straddles and passes through opposite pairs of flanges. Fig. 8, shews, in perspective, the shanks, when slid into and along one another, by means of the axial slots shewn at fig. 6. Figs. 9, shew transverse sections of different forms of shanks, consisting of diverging flanges, and the best modes of fitting them together as pairs. The flanges of one shank bear tightly against the flanges of the other shank, like the legs of a clutch-box. Fig. 10, represents, in perspective, a suitable press for manufacturing such articles as are germain to this invention;—specimens of some of which are shewn in the drawing.

It has hitherto been the practice to mould mineral masses around a metallic pattern screw, which was withdrawn before the mineral cooled too much, or contracted too tightly upon it. This plan was obviously too nice and uncertain to admit of extensive use; as the mineral was found liable to contract too much or too little after the withdrawal of the pattern screw. If the mass of metal to be screwed therein proved too large, as in the first case, the mineral would break on the metal being forcibly screwed in; and in the latter case a loose fit would be the result. Mineral has also been permanently moulded for the purposes of attachment around massive and solid bodies of metal, either wrought, rolled, or cast; the metal having variously devised heads or loops, to give hold and strength to the junction; but this is liable to the objection that the difference between the expansion and contraction of the mineral and the metal is destructive of the

fabric. To roll or forge these masses of metal is too costly and nice an operation; and to cast them is to render them liable to great unevenness of surface, swellings, sand-blows, and other defects.

The following remarks, although directed particularly to the manufacture of door-knobs, are equally applicable to the manufacture of other articles contemplated under this invention:—All the difficulties which have been hitherto most prominent in the manufacture of mineral door-knobs are avoided by using, for the shank, either a metallic tube, whether made of cast, wrought, or rolled metal, or of a strip of metal having one or more diverging flanges. The longitudinal slit, incident to making tubular shanks of sheet-metal, allows the metal to adapt itself reasonably and sufficiently to the set of the contracting mineral, and is unquestionably the best mode of manufacturing mineral knobs with tubular shanks. A slight upset on the end of the shank forms a strong and tenacious head, around which the mineral cools with an uniformity that leaves the knobs precisely the same in size and figure, and, consequently, complete fellows. It may be remarked, however, that an upset is not absolutely necessary,—the shank holds well without it, especially if the lower end of the tubular shank is made open-mouthed or bell-shaped, as at figs. 1, and 2. The centre space in the tubular shanks also plays an important part, as by it the mineral hottest at that point is allowed vent when displaced by the insertion of the shank; and thus double the hold the mineral could have on a solid shank is attained;—still, if the end of the tube were closed, and large slots made in its sides or periphery, the mineral would be forced through, and the advantages would be attained in an analogous manner. A tube, closed at the end, and inserted at the same end into the mineral, will make a knob somewhat similar, but inferior to the other varieties.

These knobs or other articles of similar manufacture, being always, when made, complete fellows (a desideratum long sought after by purchasers), are capable of receiving the best finish. The mounting made for one is equally suited to fit any other; and these mountings drop right into their places, and can be fastened with cement or alloy, or be made in thmeselves sufficiently solid to clasp the shank, whatever be its shape. The hollow shank permits the instant cooling of the same when being mounted, by being filled with water if desired.

Knobs made in the manner above described, having tubular

shanks, are always fellows, if the same mould is used; and one knob can scarcely be distinguished from another in a lot.

The shanks represented in the drawing, from fig. 6 to 9, are intended for insertion into knobs with a mineral neck as well as body. So slight is the disturbance due to or consequent upon inserting these shanks into the mineral, that the great economical desideratum in this kind of manufacture is attained; viz., making a mineral knob with a mineral neck at one and the same operation, and thereby getting rid of the great expense of metallic mounting: the quantity of metal saved by this plan is also an object, and pays a large portion of the expense in moulding and finishing mineral knobs.

Rolled or sheet metal is preferable for the shanks, as it is usually more free from burrs or irregularities than cast metal; the former being less exposed to disturbing accidents in its employment for this purpose; and it likewise furnishes a shank of equal strength and greater lightness than cast metal. The slight amount of metal, cast, wrought, or rolled, which is inserted, disturbs so little the hot mineral, that a skilful workman, after a little experience, can scarcely err in the quantity of mineral he should put in the mould.

The patentee claims making mineral or vitreous manufactures, especially mineral or glass door furniture and other knobs, with a tubular metallic shank (with or without slots or a longitudinal slit), or a shank made of a strip of metal, consisting of diverging flanges; such tubular or diverging flange shanks being inserted into the mineral or vitreous matter at a proper stage of the process; so that the quantity of metal in the shank, in proportion to the bulk of mineral or vitreous material admissible in the case, and comparatively to the extent of surface in contact with the mineral or vitreous material, is very small; and the mineral or vitreous material is consequently allowed to take its set about, within, and around the more or less attenuated and elastic metal shank, without any undue strain upon, or disturbance of, the crystallization of the vitreous or mineral matter;—thus rendering the destructive tendencies arising from the unequal expansibility of the metal and vitreous or mineral matter, too slight, practically, to endanger the soundness and durability of the finished article.—[*Inrolled, March,* 1850.]

To Thomas Richards, William Taylor, & James Wylde, *the younger, all of Falcon Works, Walworth, in the county of Surrey, cotton manufacturers, for improved rollers to be used in the manufacture of silk, cotton, woollen, and other fabrics.*—[Sealed 2nd March, 1850.]

The patentees commence their specification by stating that fibrous materials, before they are spun or drawn, generally contain a portion of some deliquescent salt, which becomes imbedded in or deposited on the leather covering of the ordinary drawing-rollers, and in damp weather the salt attracts moisture, which causes the fibres to "lap." The patentees therefore propose to manufacture the drawing-rollers of silk, cotton, wool, and flax-spinning machinery, and the drawing-rollers of machinery for manufacturing such fabrics as paper, felt, and wadding, with a covering or outer surface of vulcanized or metallo-thionized caoutchouc (India-rubber) instead of leather; whereby a repellent surface, or one which will not absorb moisture, is obtained;—the liability of the fibrous materials to lap or to be drawn round the roller, during the process of drawing and spinning, will therefore be avoided, and they will consequently be delivered in a uniform and unbroken state. The tubes of vulcanized or metallo-thionized caoutchouc, which are to be used for covering the rollers, are prepared for this purpose by boiling them, for a period of from four to six hours, in an alkaline solution (by preference, a solution of caustic soda or caustic potash) to which flour of sulphur has been added: the caoutchouc is rendered more solid by the action of the alkali, and a certain degree of roughness is given to its surface by the sulphur, which renders it more suitable for the drawing operation.

In Plate VIII., fig. 1, is a longitudinal section of part of a drawing-roller, furnished with short tubes or covers of vulcanized or metallo-thionized caoutchouc, according to this invention; and fig. 2, is a tranverse section of a pair of drawing-rollers, the upper one of which is covered with caoutchouc. The tubes of caoutchouc *a, a*, are retained in their places upon the drawing-roller by collars or "ruffs" *b, b*; and the tubes are made of such thickness that the outer surface thereof will project from one-sixteenth to one-eighth of an inch beyond the outer edge of the collars. It is requisite to distend each tube *a*, in order to pass it over the collars *b*, into the space included between a pair of collars; and for this purpose the patentees employ what they term a director, consisting of two tapering metal plates *c, c*, (one of which is shewn,

separately, in plan view, at fig. 3,) combined together so as to form a hollow cone, into the larger end of which the end of the drawing-roller is inserted, and the tube of caoutchouc is then drawn over the director on to the roller.

The patentees claim the construction of drawing-rollers, to be employed in the manufacture of silk, cotton, woollen, and other fabrics, by covering the peripheries of cylinders, composed of any suitable material, with tubes of vulcanized or metallo-thionized caoutchouc, prepared and fitted as described. [*Inrolled September*, 1850.]

To Ewald Riepe, *of Finsbury-square, in the county of Middlesex, merchant, for improvements in the manufacture of steel,—being a communication.*—[Sealed 29th January, 1850.]

This invention consists, firstly, in a method of converting pig-iron into steel in the puddling furnace; secondly, in converting pig-iron, or alloys of pig-iron and wrought-iron, into steel, by exposing the same to the action of clay at a proper temperature; and thirdly, in manufacturing steel by causing atmospheric air to pass over bars of cast-iron, or alloys of pig-iron and wrought-iron, when the same are at a red heat.

In carrying out the first part of the invention, the patentee charges the puddling furnace with two hundred and eighty pounds of pig-iron, and raises the same to a red heat. When the iron begins to melt, from twelve to sixteen shovelsfull of iron cinder or slack (obtained from the squeezing machine or rolls) are thrown into the furnace, and the damper is partly closed. The mass is then well puddled, with the addition of a little black oxide of manganese, common salt, and dry clay, ground together into powder; and after a few minutes the damper is fully opened. Forty pounds of pig-iron are now introduced into the furnace, and deposited upon a bed of cinders (above the mass of melted metal), near the fire-bridge; when this pig-iron melts, and begins to trickle down, it is raked into the melted metal below; and the whole is then covered with cinder or slack, and the heat is maintained until the well-known blue flames shoot through the cinder or slack. The mass soon begins to swell and throw up small grains; and when the grains appear through the cinder, the damper is to be three parts closed, and the remainder of the process is to be carried on slowly, while the metal is well puddled beneath the layer of cinder. By the fusion of the grains the

mass is caused to assume a waxy appearance; and when this occurs the damper is to be completely closed: it is requisite that the latter part of the process should be carried on carefully and slowly; as otherwise the greater part of the mass would remain in the state of iron, in place of being converted into steel. A portion of the metal is now to be taken out of the furnace, in the form of a ball, and tilted or otherwise wrought into bars (the other part of the metal remaining covered with cinder in the furnace); and then a further portion is to be taken out and treated in like manner; and so on, until the whole of the metal has been removed from the furnace.

The patentee states, that when using pig-iron made from sparry ore, or a mixture of it with other pig-iron, he adds only about twenty pounds of the former pig-iron, at the latter part of the process, instead of about forty pounds. When he employs "refined Welch," or pig-iron of that description, he throws ten pounds of best plastic clay, in a dry granulated state, before the commencement of the process, on to the bottom of the furnace; and he adds, at the latter part of the process, about forty pounds of the pig-iron—strewing clay over it in the proportion just mentioned. He does not claim the commencement of the above-described process for making steel in the puddling furnace; but he claims regulating the heat in the finishing process, and excluding the atmospheric air from the mass, in the manner described; and also the use or addition of iron to the mass towards the latter part of the process.

In order to manufacture steel according to the second part of the invention, the patentee casts pig-iron, or alloys of pig-iron and wrought-iron, into thin bars, from a quarter to three-quarters of an inch thick, with longitudinal nicks or grooves therein, to facilitate the separation of the same into rods or strips after the conversion of the metal into steel. The bars are enveloped in the best plastic clay, and introduced into the furnace represented in Plate IX., where fig. 1, is a longitudinal section, fig. 2, a horizontal section, and fig. 3, a transverse vertical section thereof. The bars, after being completely enveloped in clay, are introduced through the opening *a*, into the furnace, and are piled therein in the manner shewn at fig. 3, so as to leave numerous longitudinal channels *b*, *b*, through the pile of bars, for the passage of the flame and products of combustion from the fire-place *c*, to the exit-flue *d*, which leads to the chimney: it is essential to the success of the operation that each bar should be perfectly enclosed in the clay; and, therefore, if a portion of the clay covering

should be accidently removed, when placing the bars in the furnace, it must be restored. After the bars have been placed in the furnace, the opening *a*, is to be built up with fire-brick, leaving only a small aperture through which samples may be taken out of the furnace to ascertain the progress of the operation. The bars are gradually raised to a red heat, which is not permitted to rise beyond the welding heat of shear-steel; this heat is maintained for a period varying from twenty-four hours to three days, as may be found necessary; and when it is found that the iron has been perfectly converted into steel, the fire is put out, and the steel is allowed to cool down gradually before it is removed from the furnace.

Under this head of the invention, the patentee claims the converting of pig-iron or alloys of pig-iron and wrought-iron into steel, by exposing them to the action of clay at a proper temperature.

The mode of converting cast-iron or alloys of pig-iron and wrought-iron into steel by the action of atmospheric air is as follows:—the bars of iron are placed in a cylinder, made of fire-stone or other suitable substance, and set in a furnace, as shewn in fig. 4, which is a vertical section of the furnace and cylinder *a*. The cylinder is furnished with two pipes *b*, *c*, (the latter having a valve in it) for the purpose of passing a current of air through the cylinder: and the bars are to be piled in such a manner that the air may pass freely from end to end of the pile and act upon the surface of every bar. When the bars have been placed in the cylinder, its ends are closed with fire-bricks (leaving a small aperture, which is also kept closed, except when samples are to be drawn); after which, the whole is brought to a red heat; and then, by opening the valve in the pipe *c*, air is caused to pass through the cylinder. The patentee says, that "the atmospheric air produces hammer-slack on the surface of the bars, which adheres very close to them, and acts much more decarbonizing than the hitherto known method of annealing with oxidizing substances, as oxide of iron, manganese, &c." When the samples, which are drawn out from time to time, shew that the process is finished, the furnace is cooled down; the bars are then taken out, the slack is knocked off, and they are formed, in the usual way, into bars of the requisite size.

The patentee states, that he does not confine himself to the particular construction of furnace, nor to the annealing by oxidating substances; but what he claims is, the particular way of annealing by means of atmospheric air, which is carried over bars of cast-iron or alloys of pig-iron and wrought-iron at a red-heat.—[*Inrolled July*, 1850.]

To Henry James Tarling, *of Bayswater, in the county of Middlesex, commission agent, for improvements in the manufacture of fuel and manure,—and deodorizing and disinfecting materials.*—[Sealed 7th March, 1850.]

The first part of this invention relates to improvements in the manufacture of fuel, and consists in combining refuse tan and tar, peat and gas-tar, refuse tan and rosin-oil, and peat and rosin-oil, and employing these mixtures as fuel.

Fuel is manufactured from refuse tan and gas-tar, by mixing one bushel of dry refuse tan with about one quart of gas-tar, in the state that it comes from the gas-works, and thoroughly combining these materials by stirring: the fuel may be burned in this state; or it may be compressed in moulds into blocks of any desired form. Peat in a dry state, and broken into small pieces, is combined with gas-tar in the same proportions as the refuse tan, by stirring the peat and gas-tar thoroughly together. If the fuel is required to be more highly inflammable, in order that it may be used in a furnace with a bad draft, the proportion of gas-tar is to be increased. When the fuel is to be manufactured from refuse tan and rosin-oil, or peat and rosin-oil, the materials are combined in the proportion of one bushel of refuse tan or peat to about one pint of rosin-oil.

The patentee states that he is aware that refuse tan and peat have before been combined with other matters for manufacturing fuel. He does not therefore claim the use of refuse tan or peat generally; but he claims the manufacture of fuel by the employment of refuse tan when combined with gas-tar, also peat and gas-tar, and peat and rosin-oil, and refuse tan and rosin-oil, as above described.

The second part of the invention consists in manufacturing manure by combining highly carbonized refuse tan with night-soil. The tan and night-soil may be mixed in equal quantities; but the patentee does not confine himself to these proportions. He claims, as his invention in the manufacture of manure, the employment of highly carbonized refuse tan, when combined with night-soil, as above described. He states that he also claims the employment of this highly carbonized refuse tan, which is converted into a charcoal, for the purpose of disinfecting or deodorizing night-soil and various other matters; and he finds from experiments that the quantity sufficient for such purpose is about an equal part, by measure, of this carbonized tan, to the quantity of matter operated upon.—[*Inrolled September*, 1850.]

To Richard Archibald Brooman, *of the firm of Messrs. J. C. Robertson & Co., of Fleet-street, in the City of London, for improvements in types, stereotype-plates, and other figured surfaces for printing from,—being a communication.*—[Sealed 7th March, 1850.]

This invention consists in coating or covering types, stereotype-plates, and other figured surfaces for printing from, with some protecting metal, which, being harder than the metal whereof they are made, will increase their durability without impairing the sharpness of the impressions obtained from them.

The metal which has been found most suitable for coating the printing surfaces is copper; and it is to be deposited upon them by the process of electro-deposition. The coating of metal is to be obtained upon a stereotype-plate or similar printing surface by introducing a solution of a salt of copper (when copper is the metal that is to be used for coating the printing surface) into the proper cell of a galvanic battery, and then immersing therein the stereotype-plate or other printing surface, which should be perfectly clean and free from oxide: by this means a coating of copper, of any desired thickness, will be deposited on the plate—depending on the time that the plate remains in the solution and the strength of the battery. When types are to be operated upon, they are tied together in large quantities, and only the projecting or printing surfaces thereof are immersed in the solution, so as to receive a coating of copper: therefore, when a page of such type is set up, the upper surface will appear as if it were composed of copper, while the other parts will present the ordinary appearance of type-metal.

The patentee claims the covering, coating, or plating the surfaces of types, stereotype-plates, and other figured surfaces for printing from, in whole or in part with some protecting and preserving metal, as above described.—[*Inrolled September,* 1850.]

To Thomas Irving Hill, *of Clapham, in the county of Surrey, gent., for certain improvements in the treatment of copper and other ores, and obtaining products therefrom.*—[Sealed 9th March, 1850.]

This invention consists, firstly, in certain improvements in treating copper ores, to obtain products therefrom; and, secondly, in improvements in the treatment of iron ores.

The first part of the improvements in treating copper ores

relates more particularly to what are called refractory ores. In smelting copper ores, fluxes are used to facilitate the process; and this part of the invention consists in the employment of a flux composed of galena or sulphuret of lead, combined with baryta, carbonate or sulphate of baryta, or carbonate or sulphate of strontia—the combination of galena and baryta being preferred: the galena increases the general fusibility of the mass, and improves the quality of the copper. The patentee states, that he is aware that it has been before proposed to use the sulphate of baryta, combined with other matters, as a flux; and he does not therefore claim the same when separately used. The ingredients are to be mixed in the proportion of $\frac{1}{10}$th of galena to $\frac{7}{10}$ths of baryta; and this flux is to be introduced into the furnace in the ordinary manner. The workman will use such quantities of the flux as the nature of the ore requires; but the patentee states, as a guide, that when treating ores of an average of 12 per cent. of copper, the flux should be employed in the proportion of about $\frac{1}{8}$th of it to $\frac{7}{8}$ths of the ore. The flux may be introduced into the ore when in the melting and roasting furnaces.

Another improvement consists in a mode of applying prepared oxygen gas to the calcining, roasting, and melting furnaces, so as to promote the acidification of the volatile matters and the oxidation of the iron and other extraneous metals that may be contained in the copper ores; and also in employing such gas to facilitate the combustion of the smoke arising from the burning of the coal in the furnace. The patentee says, that he does not claim the use of oxygen gas generally in the treatment of copper ores, as the same has been before used. He obtains the oxygen gas by introducing black oxide of manganese into retorts, situated near the calcining furnaces, and submitting the same to a high degree of heat; and he conducts the gas from the retorts, through tubes, into a receiver or gasometer (supplied with water, like those used in the manufacture of coal-gas), and thence, through other tubes, into the furnaces, which it enters through openings in the sides of the furnace or over the bridge, and, mixing with the products of combustion, ignites the same.

The improvements in treating iron ores consist, firstly, in the use of carbonate of baryta as a flux, which is to be mixed with the iron ore before it is introduced into the furnace; and, secondly, in the employment of oxygen gas, obtained in the manner above described, to facilitate the process of smelting the ore,—the gas being used in the same way as when treating copper ore.

The patentee claims, Firstly,—the employment of sulphuret of lead in combination with baryta, or carbonate or sulphate of baryta, or carbonate or sulphate of strontia, as a flux for the treatment of copper ores; and also the application of oxygen gas, prepared in separate retorts, and conveyed into the furnaces for the treatment of copper ores, as above described. Secondly,—the employment of carbonate of baryta as a flux in the treatment of iron ores; and also the use of oxygen gas, prepared in separate retorts, and when caused to combine with the products of the coal in the furnace, so as, by igniting such products, to facilitate the smelting of iron.—[*Inrolled September*, 1850.

To JULIAN EDWARD DISBROWE RODGERS, *of High-street, Pimlico, professor of chemistry, for improvements in the manufacture of white-lead,—being a communication.*—[Sealed 1st August, 1849.]

THIS invention consists in manufacturing carbonate of lead, commonly called white-lead, by subjecting metallic lead to the united action of a certain temperature, atmospheric air, aqueous and acetic acid or pyroligneous acid vapours, and carbonic acid gas, in such manner as to have the process completely under the control of the operator.

The improved process of manufacturing the carbonate of lead is carried on in a chamber which is capable of being heated by steam-pipes or other means, and is so constructed as to admit of it being made dark and air-tight, or nearly so, and to permit the escape of vapours and gases when required. This chamber is fitted with wooden frames, from the ceiling to the floor, provided with cross pieces of the same material for supporting the lead, and so arranged that the operator may pass between the rows, in order to watch and regulate the conversion of the same into carbonate of lead. Troughs or vessels are placed upon or let into the floor of the chamber—some of them being designed to contain a fluid undergoing vinous fermentation, and thus to supply carbonic acid gas; and the others (into which pipes from a steam-boiler, furnished with stop-cocks, dip), being intended to contain weak vinegar, dilute pyroligneous acid, acid wine, sour beer, or a liquid undergoing acetous fermentation, for the purpose of supplying acetic acid vapours by the means hereafter mentioned.

The lead to be operated upon is cast in sheets, three or four feet long, and about one-eighth of an inch thick; and these

sheets are doubled and hung upon the wooden frames as close together as possible without touching. The first-mentioned troughs or vessels are now charged with an infusion of malt with sugar (formed by adding eight gallons of boiling water to one peck of malt and two pounds of sugar) or any other liquid capable of undergoing the vinous fermentation spontaneously or when mixed with yeast or other fermenting agent: the other troughs or vessels are supplied with weak vinegar, dilute pyroligneous acid, acid wine, sour beer, or a liquid undergoing acetous fermentation; and the temperature of the chamber is raised, by the steam-pipes or other means, until it is between 70° and 80° Fahr. When the vinous fermentation is fully established, and carbonic acid gas is being evolved in the chamber, it is darkened and closed as perfectly as possible; and then steam is admitted from the boiler, through the pipes, into the weak vinegar or acid liquor, so as to charge the chamber with aqueous and acetic acid vapours. The introduction of steam into the chamber must be continued for an hour, and be repeated three or four times in every twenty-four hours; and the temperature of the chamber must be maintained between 70° and 80°—which may be ascertained by placing a thermometer with its bulb in the chamber and its stem outside the same. The operator must enter the chamber, in order to renew the fermenting and acid liquids, once in every forty-eight hours during the progress of conversion, which is usually complete in about twelve days.

The patentee states that he does not confine himself to any particular form of chamber. Nor does he confine himself to the use of lead cast in sheets; although he prefers the lead to be so prepared, because it is more easily acted upon. Nor does he confine himself to fermentation alone as the source of the necessary carbonic acid gas; as the action of certain acids on chalk, marble, and other carbonates, or the combustion of coke, charcoal, or other substances rich in carbon, would yield an abundant supply; but he prefers to obtain the the carbonic acid gas by fermentation, because such a liquid as that above described passes rapidly from the vinous to the acetous fermentation, and may then be economically employed to furnish acetic acid vapours, in place of vinegar or pyroligneous acid.

The patentee claims, as his improvements in the manufacture of white-lead, first, the use of a room or chamber, such as above described, or one constructed upon the same principle, whatever may be the form: namely, one capable of being rendered air-tight or nearly so, when necessary, and

into which the supply of carbonic acid gas, and acetic acid or pyroligneous acid and aqueous vapours can be controlled or regulated. Secondly,—the introduction of steam into the converting chamber either alone or in the manner above described. [*Inrolled February,* 1850.]

To James Banister, *of Birmingham, manufacturer, for a certain improvement or certain improvements in tubes for locomotive and other boilers.*—[Sealed 12th October, 1849.]

This invention consists, firstly, in manufacturing tubes for locomotive and other boilers by combining three tubes of different metals into one tube; and, secondly, in a mode of manufacturing tubes of copper, brass, or other alloys of copper, for locomotive and other boilers.

In manufacturing a tube according to the first part of this invention, the patentee takes three tubes of different metals, viz., brass, iron, and copper, and places them one within the other, in such manner that the brass tube will be the inner one, the iron tube next, and the copper tube the external one; and he then introduces a slightly tapering mandril into the inner tube, and draws the tubes through a series of dies until they are closely combined. As the tubes are in a soft or annealed state when put together, it will not be found necessary to anneal them afterwards, because the extent of drawing down is but small. The patentee prefers to employ brazed tubes, as thin tubes of that description can more readily be obtained. By this mode of constructing tubes, the patentee obtains the beneficial results consequent on using brass where the rush of the flame and products of combustion take place, together with the advantage of having the copper next the water, and the whole stiffened by the use of iron: but when the fire is to act upon the exterior of the tubes, the order of the arrangement must be reversed.

The improvement in manufacturing tubes of copper, or brass, or other alloys of copper, consists in a new mode of joining the seams of such tubes. The metal is first bent into the form of a tube, so that the edges come together; and then the edges are filed with a triangular file, so as to form a kind of angular gutter. The tube is filled with sand, and the exterior is covered with sand, in which a gutter is made opposite the gutter formed by the chamfered edges of the metal; the tube is then heated to a bright-red heat, and melted metal (similar to that of which the tube is made) is poured into the

gutter,—whereby the edges of the tube will be partly fused, and the whole will set into a solid mass; and when it has become cold, the projecting ridge of metal at the seam is removed by a circular saw or other convenient means. The tubes are afterwards passed two or three times between grooved rollers, having a mandril in them; and then they are completed by drawing through dies with a mandril. The patentee remarks that the edges of the metal may be removed by other means than a file, and that other material than sand may be used.

He claims, Firstly,—the manufacture of compound tubes for locomotive and other boilers, as above described. Secondly, the mode, above explained, of joining the seams of tubes of copper, of brass, and other alloys of copper, for locomotive and other boilers.—[*Inrolled April,* 1850.]

To George Attwood, *of Birmingham, copper-roller manufacturer, for a new or improved method of making tubing of copper or alloys of copper.*—[Sealed 15th April, 1850.]

The improved method of making tubing of copper or alloys of copper, which constitutes this invention, consists in employing for that purpose the hollow rollers, made of copper or copper alloyed with small quantities of other metals (and not soldered or brazed), which have been used for printing or otherwise operating upon cotton and other textile or woven fabrics, or upon paper or leather, and are worn out, or are no longer wanted for such purposes.

The patentee first removes from the interior of such rollers the neb or notch usually formed therein or attached thereto, for the purpose of securing the roller firmly upon the iron or other spindle or mandril on which it is to be mounted: this he effects by means of a lathe or other suitable apparatus.

He then heats the rollers and reduces them to tubes of the desired diameter and substance, by passing them between suitably-grooved rollers and over a mandril, or by subjecting them to the action of a draw-bench, in the manner commonly practised for making tubes which are not soldered or brazed. The rollers are to be annealed from time to time, as may be necessary; and in some cases they are to be rolled more or less at a red heat. In this manner tubes may be made of the length, diameter, and thickness of metal most suitable for use in the boilers and other parts of steam-engines, in brew-

eries and distilleries, for gas-fittings, upholstery, sugar-works, and other purposes for which they may be required.

In conclusion, the patentee says, "I claim the exclusive use of such rollers for the purpose of making tubing, as are usually known and commonly called copper rollers in Lancashire and other places where they are made and used for printing and otherwise operating upon cotton and other textile or woven goods or fabrics, and upon paper or leather, and which have been used for one or other of those purposes, and which are worn-out or done with, or are no longer wanted for the said purposes. And I also claim the exclusive use of such old, worn-out, done with, or no longer wanted copper-rollers as aforesaid, for the purpose of being elongated, contracted, or extended for the purposes of the kinds of tubing as aforesaid."—[*Inrolled September*, 1850.]

Scientific Notices.

ON THE BASIS OF JUDICIOUS LEGISLATION.

In a former paper* we put forth a suggestion for enriching our scientific literature, by placing on record a history of the progress of invention; the design being—to class inventions according to the natural laws on which they are based—to arrange them chronologically—and to shew, by the gradual development of the inventive faculty, how wide is the application of these laws to the use of man; and by tracing the memorable instances of failure in this section of scientific pursuits, to shew that ability and perseverance, applied in ignorance or disregard of first principles, will necessarily secure no beneficial result. On further considering the subject, we see no reason why an enquiry into the successes and failures of mankind should be confined to their labors in the fields of mechanical and chemical science; on the contrary, we think that, important as the pursuit of this study unquestionably is, from its close connection with the physical wants of man, yet the facts determined by such an enquiry would be of far less practical use than the discoveries which a philosophic mind, applied to analyze the acts of men and nations in connection with the moral world, might be expected to effect. Indeed we know of no nobler or more useful occupation for the philosopher than a patient study of the recorded actions of nations

* Vol. XXXV., p. 183.

or governments (many of which have changed the face of society, either by sudden convulsions, or slow and certain means), with the view of assigning the true spirit to the policy which dictated their performance, and of comparing or contrasting that spirit with the principles deducible from the moral code inherent in the human breast. This enquiry might be extended, with more advantage than the mere gratification of an idle curiosity, to as early a date as the existing annals of the world will allow; but for the special object which we have in view, viz., to ascertain how far men have acted up to the knowledge they possess, it would be sufficient to take the history of Modern Europe, or even that of one of this community of nations, commencing from the period when the system of morals, as derived from revelation, was nominally adopted for the basis of all forms of government. Taking England, from the dissolution of the heptarchy, as an example, it would be instructive to lay bare the source, and expose the workings of that impulsive spirit which prompted the successive rulers to the performances which raised the nation from being a feeble prey to foreign ambition, to the position of a formidable aggressive power—to compare their private motives with their published pretexts, and to contrast these again with the immutable laws which they acknowledged as binding for the government of nations. The inroad and usurpation of the Norman power—the Irish crusade of Henry II.—the crusade in Palestine by his son and successor Richard I.—the memorable insurrection of the barons in the succeeding reign, and their extortion of Magna Charta—the conquest of Wales—the wars with Scotland and with France—the civil commotions and intestine feuds—would severally furnish an instructive lesson; but what would chiefly subserve the wants of the present age, would be an analysis of the policy of the rulers in legislating for the people, with the view, in the first instance, of bringing them under the discipline of civil rule, and turning their minds from the contemplation of deeds of rapine and slaughter to the cultivation of the peaceful arts, and, subsequently, of rendering them better able to yield greater and still greater sums into the public treasury.

In pursuing our enquiry we should find how that, in early times, when the knowledge of legislation was limited to little more than a just appreciation of right and wrong, men were allowed, for example, free liberty to exchange their produce whenever and for what they pleased, and to associate together for the purposes of self-defence. As trade and manufactures increased, and corporate bodies (the nurseries of these new

interests) grew into importance, we should perceive an antagonism set up against the feudal lords, and a consequent jealousy displayed, on their part, of the wealth and power of their rivals: from which originated laws to cripple the growth of corporate bodies. At a subsequent period, the royal authority having become predominant, the principle of *meum* and *tuum* between the king and his subjects would appear in a somewhat confused light; and subsequently the commercial rights of the people, after many partial submergings, would, by dint of the judicious application of threatening and bribes, from being fragmentary and uncertain, assume a clearer and more defined outline. But the progress of this policy of our rulers, whereby manufactures and commerce became more stable and remunerative, would, as far as the spirit which dictated it was concerned, display a continued retrogression from the first principles upon which legislation was, perhaps unconsciously, at an earlier age, and ought ever to be, based; for it was not long before the discovery was made, that the cost of articles of produce was regulated by the demand,—and that, by diminishing the demand, the price would necessarily fall. As then wool and corn, articles capable of consumption in this country in unlimited quantities, were exported to the continent, and thus the price to the English consumer was enhanced, the happy thought of narrowing the market by stopping all exportation of these commodities was quickly carried out. A profitable source of income, independent of direct taxation, was also found to arise from laying a duty upon all produce introduced into the country. But, as by the carrying out of this system, a dead lock would have been placed upon our foreign commerce, it was found expedient, by the advisers of the crown, not to revert to the primitive system of free intercourse with all nations, but to sell the privilege of exporting and importing certain products for pecuniary or other considerations; and these rights or rather grants were renewed, modified, or annulled, as policy or interest dictated. Such, in fact, has been the course of our legislation, not merely in direct relation to commerce, but to all other subjects of which legislation is cognizable, until our code of laws has become little else than an intricate network of expediencies; in consequence of which scarcely can an amelioration be effected without interfering with a number of vested rights, the possessors of which, fearful of losing what neither justice nor common sense would have assigned them, beset and worry the luckless innovator like a swarm of hornets. It is, however, time that this should be amended, and that *legislation,* instead of being understood to be merely

the act of making laws, without regard to the value of their provisions, should be looked upon as something more honorable; or, in other words, should be raised from its fallen state and erected into the dignity of a science. It is difficult, we might perhaps truly say, impossible, to appreciate the effect which the neglect to treat legislation as a science has had upon the social welfare of mankind; but that it has been very detrimental to man's advancement in self-government—to teach which is the great aim of education—admits of proof, if reasoning from analogy is allowed, as thus:—In the various branches of science included under the *physical world*, we are admonished of certain fixed and unchangeable laws, termed the laws of nature, which it is folly to overlook when dealing with matter, and puerile to attempt to thwart,—as upon them matter depends for retaining its persistency and characteristic properties; and so in the *moral world*, all acts which are founded on other than similar immutable principles—and therefore lack truth for their basis—will, of consequence, admit of no useful application to mankind.

That great perplexities have arisen from the selfish attempts at isolating this country from other nations, and making it as it were a world within itself, by the imposition of prohibitive duties on foreign commerce, there can be no doubt; but we must admit that, to the ordinary observer, the evil effects of other lines of policy, equally indefensible in their origin, are not so palpable; nor is it at any time an easy task to prove, indisputably, the relation between cause and effect in the moral world, although, as we believe, it is capable of as clear demonstration as a fallacy in physical science. If, then, our position be tenable, viz., that all the acts of man, whether pertaining to mind or matter, must, to be profitable to his kind, conform to some established and incontrovertible law, it follows, that all legislation should be founded, not on expediency, as the word is generally understood, but on the moral laws, which find an echo in every human breast,—that being, in fact, the most expedient law which the conscience acknowledges to be binding. It is however too evident that this is not the view which our legislators take of their duties; for how, in that case, could lines of policy be adopted, and followed for a term with implicit faith, only to be thrown aside and their opposites as diligently pursued? If such were the case in the physical sciences, their votaries would meet with the ridicule they deserved; and yet for them a good excuse might be pleaded, inasmuch as the light of truth in many sciences is as yet but dimly shadowed forth, and that

new discoveries, elucidating principles hitherto unknown, demand a reversion of opinions; whereas, in the moral world, no hidden truths remain to be discovered, but *all* have been long revealed, and are capable of appreciation by the mind of man. Legislation should, therefore, as being founded on a recognizable and incontrovertible basis, be far in advance of other sciences: experience does not, however, bear out this natural inference; for, too often, in the desire to obtain even a worthy object, is the principle which should be followed in its pursuit entirely lost sight of. A reference to the statute book, for almost any period, will prove this assertion; while, in other sciences, no such instances can be adduced of the want of penetration or neglect in the labors of their recognized professors. Again, if we compare the acts of legislators and men of science, we shall find that, while the latter are building upon the labors of their predecessors, the former are chiefly engaged in pulling down and remodelling what their predecessors had effected. This we must acknowledge is in part necessary; but it arises from no other cause than that fundamental principles have, as a rule, been long lost sight of;—for, if a given system of policy will bear the test which we contend should be applied to all acts of government, no necessity can ever arise for its subversion. Under such a system, as society advances, and interests naturally become more intricate, a modification merely of particular statutes will be required to meet the change of circumstances induced by a higher civilization. That this fact is not now wholly disregarded we are well aware; for the present century has produced some brilliant examples of philosophers who have incontrovertibly established principles in political economy, and of statesmen who have been wise enough to apply them. These are, however, but few in number; and, as a set off, many recent instances might be adduced, to shew that first principles have been disregarded, and that mistrust and confusion have resulted therefrom. It must be admitted, that the legislator's duty is not merely to keep first principles in view; but, inasmuch as he has come to a work but slovenly performed by his predecessors, he cannot entirely overlook the class-interests which an unwholesome state of the laws has created; and therefore he has his share of perplexities to encounter. On the other hand, in the absence of such difficulties, he is, as we maintain, bound to act so as to prevent similar perplexities occurring to his successors; for, to descend from generals to particulars, and take an apt though (compared with the largeness of the subject) a minor illustration, the concoctors of that supreme

folly—the Non-ornamental Designs Act—should, before placing it on the statute book, have well considered how two laws, having in part the same object, viz., the protection of a certain class of useful inventions, could work together, when the means for obtaining protection under them were completely at variance. Under one law, as is well known, the right is granted as soon as applied for; while the practice under the other, causes great delay in securing the grant; in one case a description of the invention is publicly recorded at the time of the grant, and in the other, the applicant is not necessarily called upon to explain his invention until six months have intervened; by one grant, protection (for the sole use of the discovery) extends over the whole kingdom, and by the other, it is confined to a grant. The evil which this Designs Act was calculated to entail upon the community of inventors should have been foreseen; and further, the proved impossibility of giving a definitiveness to its provisions, and thereby clearing it from the scope of the patent laws, should have sealed its doom, even if no positive evil could have been apprehended from its working.

To a thinking mind, the fact, that the difficulty of affixing precise limits to the scope of the act, yet remained unsolved, might well have suggested doubts of its practical usefulness; for, if no line of demarcation could be assigned, it would follow, that the act was based upon no definite principle. This was, however, disregarded, and, in spite of our repeated demonstration of its inapplicability to its intended purpose, this act has been allowed to remain in force, until it has presented a bar to the adoption of a wise and prudent suggestion for securing to exhibitors of inventions at the "world's fair" of 1851, a property in their ingenuity. It would be out of place to explain in this paper the reasons which induced the virtual abandonment of the project for provisionally registering inventions; but it will suffice to say, that they originated from the impossibility of reconciling the two modes of procedure in effecting the registration and patent grants; whereas the patent law by itself would have been perfectly manageable. This example shews that unwise laws act injuriously both directly and indirectly, and thus a double stimulus is furnished to our senators to regard their calling as a science. We trust that as respects the laws with which we have a more immediate concern, they will ere long receive the special attention of the Attorney-General, with the view to their amendment; and having confidence not merely in the name, but the abilities which he inherits, we doubt not that we shall have to record a gratifying instance of a return to first principles in our legislation.

AN ACCOUNT OF THE EMERY OF ASIA-MINOR, AND THE MINERALS ASSOCIATED WITH IT—GEOLOGICALLY.

BY M. J. L. SMITH.

[Translated for the London Journal of Arts and Sciences.]

Among the various mineral substances employed in the arts, emery is, perhaps, the one whose geological character has been least examined, and respecting which, there is most yet to be learned; yet, in both a practical and scientific point of view, the enquiry into the geology of this substance is full of interest. The existence of emery in Asia-Minor was not known up to the year 1846. At the commencement of the following year, I discovered this mineral in situ for the first time in Asia-Minor; but since that period, I have discovered it in several localities in the same country. The principal situations in which emery is found in Asia, are—Gumuch-dagh and Kulah. The first of these is a mountain, near the interesting ruins found by the French traveller Poujoulat to be those of the ancient Magnesia. The second, Kulah, is in that part of Asia-Minor called Catacecummeny, or the country of fire. The geological formation of these places consists essentially of metamorphosed limestone, overlying micaceous schist, gneiss, &c. The marble of Kulah has undergone a complete metamorphosis at its surface by the action of the lava, which, in former ages, flowed from the numerous volcanic craters which give to this region its peculiar aspect. The other new localities in which emery is found, are Adula and Manser in Asia-Minor; and the Isles of Samos and Nicoria. The emery is embedded either in the soil which covers the limestone, or in the rock itself. It is found in masses, some of which are no larger than a pea; while others contain some thousands of kilogrammes. The fragments of emery are generally angular; but they are also sometimes rounded, although they do not seem to have taken the latter shape by attrition. The masses which are formed in the soil above the limestone do not offer much interest to the geologist, as it is evident that they are merely brought into that situation in consequence of the disintegration of the rock in which they were originally embedded; or that they have been transported from some other locality;—it is, however, difficult to admit the validity of the latter supposition after what may be seen at Gumuch-dagh; for there it is only at the summit and not on the sides of the mountain that the emery is found. After some investigations into the nature of emery, and the rocks associated with it, I have come to the conclusion, that this substance has been formed and solidified in the limestone in which we at present find it; and that it has not been detached from more ancient rocks (such as granite, gneiss, &c.) and then deposited in the limestone at the epoch of the formation of the latter. My reasons for thinking thus are as follow:—The most careful researches in the older rocks in the neighbourhood (in those which lie beneath the lime-

stone) have failed in discovering the smallest portion of emery; besides, the blocks of emery which are found in the limestone rock never contain any foreign deposit. Although we find mica schist in the limestone at Kulah, it is never in contact with the emery, and never contains the least quantity of corindon. I consider this important to my view; for, in the specimens which I have obtained, the calcareous deposit which contains the emery exists in two different states,—one being the original limestone rock,—the other a concretion, formed by the influx of calcareous waters.

The limestone in contact with the masses of emery differs generally, both in composition and color, from the surrounding rock. At Kulah, for example, where the marble, which constitutes the limestone formation, is extremely pure, the part touching the emery is of a dark yellowish color, having the appearance of certain ores of iron, and containing a large quantity of alumina and iron. The thickness of this coating to the emery varies; but it is demonstrable that it passes gradually into the surrounding white marble, with the pure crystals of which it becomes imperceptibly mixed. If the masses of emery had been separated from some more ancient rock, and afterwards embedded in the marble, there can be no reason why the point of contact should not be definite and abrupt, without the gradual blending which I have mentioned. What we observe in this case is precisely the same as that which occurs where ferruginous and aluminous minerals are formed, and afterwards separate from limestone not yet completely solidified. There are other reasons for supposing that emery is formed in the limestone rock by a process of separation. I have a specimen which shews this in a remarkable manner; it is a nodule, in which the nucleus is surrounded by two distinct concentric layers: the nucleus consists of emery, the next layer of chlorotoid, and the exterior of emerilite,—the last being in contact with the rock. The constituents of this specimen have the following composition:—

Emery.—Mixture of corindon (alumina slightly hydrated) and oxide of iron.

Chlorotoid.—Silica 24, alumina 40, oxide of iron 28, water 7.

Emerelite.—Silica 30, alumina 50, lime 13, water 6.

In proceeding from the external surface to the centre, the greater part of the silica will be found combined with a large proportion of alumina and some lime, forming a particular kind of mineral; next, the remainder of the silica combines with a further portion of alumina, and a considerable quantity of oxide of iron to form the chlorotoid; and lastly, the alumina and oxide of iron, which remain, crystallize separately,—the homogeneous attraction of their particles being greater than their chemical affinity for each other. Effects of this kind are not rare, and they are always worthy of remark.

In concluding the considerations relating to the geological cha-

racter of emery, with respect to Asia-Minor and the neighbouring islands, I cannot help expressing a belief that future investigations into this subject will shew that emery constitutes a geognostic character and peculiarity for certain limestone deposits in this part of the world, in the same manner as the nodules of flint do for the chalk of Europe. With regard to the mineralogical character of emery, I think it ought to be considered rather as a rock than as a mineral,—and that it consists of a mixture of corindon and minerals of oxide of iron, more or less associated with other mineral substances of a similar class.—[*Comptes Rendus.*]

PHOTOGRAPHY ON GLASS.

M. NIEPCE has communicated to the *Academie des Sciences* the following account of a process for producing photographic designs upon glass plates, which we have extracted from the *Cômptes Rendus*. The foundation of this process is that known as the calotype, in which the pictures are formed upon paper. The essential part of the new invention consists, indeed, merely in the substitution of glass for paper, with certain ingenious provisions to enable the glass to receive the chemical preparation; by means of which, the picture is produced under the influence of light:—

The new process consists, in mixing with the albumen of eggs a quantity of honey, in the proportion of 2 or 3 grammes of the latter to every egg; adding to the mixture 30 or 40 centigrammes of crystallized iodide of potassium;—these must be well mixed together. It is rather difficult to spread the albumen equally over the glass plate; and there are but few persons who can succeed well in this operation. Ordinarily a glass tube or pipette is used; or the liquid is made to flow over the glass by a particular motion of the hand. When the coating of albumen is placed upon the glass plate, and has become quite dry, the plate is ready to be passed through the chemical solution, which is to endue it with the required sensitiveness to light: this solution is composed of—

Nitrate of silver	6 grammes
Acetic acid (strong)	12 ,,
Distilled water..........	60 ,,

The plate must not remain immersed in the solution more than ten seconds at the utmost, and, when removed, must be washed in distilled water;—it must then be suffered to dry in a perfectly dark place. As the plates in this state are very sensitive to light, they ought not to be prepared so far until shortly before being used: it is better to preserve them simply coated with albumen.

In the operation of the camera, it is a good plan to place behind the glass plate a piece of board, white on the surface; and to bring out the image, the gallic acid may be slightly heated, for the purpose of expediting its action without too much pressing

it; for it not unfrequently happens, that the finest negatives are those which have remained some hours under the influence of the gallic acid, and in which it was at first believed no image had been formed. The negative proofs are fixed either by the bromide of potassium or by the hyposulphite of soda; and to prevent the coat of albumen from scaling off (which sometimes happens when it is too thick, or if the eggs are old), a thin layer of gelatine or varnish is laid over the surface, to give it firmness and solidity. Among the different accelerating substances which have been tried, honey appears to be the best,—it increases the sensitiveness without having the inconveniences of other substances; such, for instance, as the fluorides, the accelerating property of which the author was long since acquainted with; but their corrosive action had induced him to abandon their use in favor of that of honey. The fluorides may however be employed without inconvenience if mixed with honey—among others, the fluoride of ammonium; and if the albumen of old eggs be mixed with this, a very high degree of sensitiveness will be obtained; but, as before stated, old albumen is more liable to scale off than that of fresh eggs. To obviate this inconvenience, the albuminous coating must be allowed to become perfectly dry before the plate is used for making positive pictures; and, for the greater certainty, its surface should be varnished.

The mixture of honey and albumen gives great softness of effect to the negative picture,—doing away with the hardness, which is considered a defect in the process; the half tints are also perfectly and harmoniously rendered. By drying the mixture, a thin coating is obtained, quite homogeneous, pliable, and not subject to crack, even when exposed to heat. In a diffused light, two or three seconds will be sufficient to produce a view of a landscape, and from five to eight for a portrait (this is with a French double-object-glass, for what is known as the quarter-plate size); for the large plate, forty or fifty seconds will be required, or twenty-five or thirty with a German object-glass. The operation may be rendered still more rapid if we unite the different accelerating means which experience has made known: thus—

1st. The thicker the coat of albumen upon the glass, the quicker the action of the light.

2nd. The staler the eggs, the more rapid the operation of the light.

3rd. The more the compound of aceto-nitrate of silver has been used, the greater sensitiveness does it impart to the plate.

There is a great deal of difference in different kinds of albumen in reference to this process,—that of eggs even seems to vary according to the nature of the food of the fowl; and the albumen of the egg of the duck appears to have less tendency to crack than that of the hen's egg. The albumen of blood is very accelerating; but it cannot be conveniently used alone, as it does not coagulate sufficiently with the aceto-nitrate of silver to cause it to

adhere to the glass;—it requires to be first coagulated with nitric acid. The sensitiveness of the plate depends also in some degree upon the manner in which the process of washing is conducted: if it be not washed sufficiently, a reddish-brown matter is deposited on the surface when the gallic acid is applied; and if it be too much washed, a considerable portion of the accelerating compound is carried away.

At the conclusion of his communication, M. Niepce exhibited to the *Academie* several proofs, obtained upon glass, as described above; and within a few days we have seen a beautiful negative of this kind, with some positive copies, at Messrs. Horne & Co's., the opticians, of Newgate-street.—[*Ibid.*]

ON THE PRESENCE OF IODINE IN FRESH WATER, AND IN TERRESTRIAL PLANTS AND ANIMALS.

BY M. CHATIN.

THE discovery of the existence of iodine in many aquatic plants of Europe, Asia, Africa, America, and New Holland, confirmed an opinion which the author had entertained, in consequence of having analyzed different plants found in the neighbourhood of Paris; viz., that iodine is present in the mass of the earth, and in the generality of fresh water.

The condition of the earth, at the different epochs of ancient vegetation, may be judged of by the proportion of iodine contained in their fossil remains. Coal, rich in iodine, should be derived from a class of plants developed in a a soil still more or less submerged in water. In anthracite, which contains less iodine than coal, we perceive that a terrestrial vegetation had begun to mingle with the cryptogamia of the coal deposit; and lignite, which contains little if any iodine, shews that terrestrial plants had, at this epoch, become predominant, and that the crust of the earth was permanently raised above the surface of the water. Iodine appears in peat; and its abundance in graphite would seem to indicate that this substance should be classed among those of organic origin: if such be the case, as it was deposited at a period far anterior to that of coal, graphite would represent the most ancient vegetation of the globe.

Fresh-water animals contain even a larger quantity of iodine than the plants growing in the same water; and the iodine in the water itself can also be directly estimated. The examination of the water of about three hundred rivers, fountains, and wells, for the purpose of ascertaining the amount of iodine present, has led to the following general conclusions:—

1. That iodine exists, in variable proportion, in the water of all fresh-water springs.
2. That the richness of water in iodine may be judged of, from the circumstance of the soil being more or less ferruginous.

3. That the quantity of iodine in water so commonly increases in proportion to that of the iron, that water, ordinarily termed ferruginous, may, with equal propriety, be termed iodinous.

4. That water which rises from the igneous rocks contains, on the average, more iodine than that which takes its origin from the alluvial deposits.

5. That among the waters of alluvial deposits, those of the chalk and ferruginous oolite contain the largest quantity of iodine—indeed, the proportion of iodine in them sometimes exceeds that in the waters of the igneous rocks.

6. That in the quantity of iodine they contain, the waters of the coal formation come next after those of certain igneous and ferruginous rocks.

7. That the waters of calcareous and magnesian deposits contain but little iodine.

8. That iodine is, above all, rare in the marl which ordinarily forms the gangue of rock-salt.

9. That the amount of the iodides does not necessarily bear any regular proportion to that of the chlorides contained in water.

10. That the waters of rivers which receive the products of melting glaciers, such as the Rhine, Rhone, Garonne, &c., contain but little iodine, particularly at the season in which they are augmented by the melting of the snows.

11. That the waters of rivers contain, on the average, more iodine, according to the smallness of the quantity of their earthy salts: they are, above all, more uniformly iodized than waters from other sources.

12. That the waters of wells contain most lime and magnesia, and, at the same time, least iodine.

The relation which exists between the iodine and iron in water—the readiness with which the iodide of iron undergoes decomposition—and the complete decomposition which is produced in the iodide of the water, when the latter is evaporated, without the addition of potassa, render it probable that the iodine exists in the water in the form of iodide of iron. Iodine is present in terrestrial plants and animals. The potash of commerce, and the greater part of the salts of which it forms the basis, contain iodine; but nitrate of potassa, cream of tartar, tartar emetic, and the double tartrate of potassa and soda, are completely free from it. Ammoniacal salts, and the salts of soda, as well as the (reputed pure) chloride of sodium of the salt marshes, contain iodine; but rock-salt, and the salt of the saline waters of the East, are quite free from iodides.

Fermented liquors contain iodine. Wine, cider, and perry, are, on the average, more iodinous than fresh water. Wines vary, in the same manner as water, according to the nature of the soil whence they are derived. Among those which have been examined, the richest in iodine were from the granitic declivities of the Maconnais and from Beaujolais; and the poorest were from the

chalk districts of Champagne. The Bordeaux, from the tertiary deposits of Girond, is also less iodinous than the wine grown on the great green chalk deposit, which extends from the neighbourhood of Cahors to near Rochelle. Milk contains more iodine than wine does; and the milk of the ass more than that of the cow. Apart from the question of difference of soil, it may be said that the quantity of iodine in milk is in inverse proportion to the amount of the secretion itself. Eggs (without the shell) are highly iodinous,—a hen's egg, weighing 50 grammes (about 760 grains), contains as much iodine as a litre (about $1\frac{3}{4}$ pints) of cow's milk, and as much as two litres of wine, or ordinary water,—such, for instance, as that of the Seine, at Paris. Iodine exists in arable land, also in sulphur, the minerals of iron and magnesia, and sulphuret of mercury; but it is rare in gypsum, chalk, and coarse calcareous soils containing silica.

It would appear that the want of a due proportion of iodine in the waters of certain districts is the principle cause of the disease termed goître,—change of the water, the use of wine, cresses, ferro-iodized waters, animal food, above all, eggs, are rationally indicated in this affection; it would also be advantageous to substitute, as a condiment, the salt of the salt-marshes for the rock-salt almost universally employed in the countries of the goître. The greater part of the substances used in therapeutics, as pectoral and antiscrofulous remedies, are very rich in iodine.—[*Ibid.*]

ON ALLOYS OF COPPER AND TIN, AND THE MANNER IN WHICH THEY BEHAVE WHEN HEATED.

BY M. C. J. B. KARSTEN.

In the experiments undertaken by M. Karsten, alloys were formed by melting together 100 parts of tin, and 50, 100, and 200 parts of copper respectively. These alloys remained perfectly homogeneous, not only in the fluid state, but also after cooling, either slowly or very quickly;—the three compounds were brittle and white. Their perfect homogeneity left no doubt of their being chemical compounds of copper and tin, and, consequently, compounds having definite proportions, even after cooling. These compounds did not undergo any change on being afterwards submitted to heat.

On increasing the per centage of copper, so as to combine 100 parts of tin with 400 of copper, the alloy obtained presented, on being allowed to cool very slowly in the crucible, a reticulated sieve-like appearance, and a close grain;—it had a dirty white color, and was somewhat brittle. When this alloy was poured quickly into a cold iron ingot-mould, it retained its properties; no change, therefore, appeared to take place, either by slow or rapid cooling. But when it is raised to a red heat, and run into moulds, the retention of the properties which it possessed before the application of heat, or, on the other hand, the formation of

an alloy, of a yellowish-white color, ductile and of granular texture, will depend upon the mode of cooling adopted. This latter quality is produced when the hot compound is suddenly cooled by plunging it into water; while the primitive compound is produced by slowly cooling in the air. If, on heating, the temperature be raised a little too high, small silver-white globules will exude from the still solid mass; but these will disappear on continuing the heating until the whole mass becomes liquid. These phenomena, produced by the application of heat, and also the non-homogeneous quality of the alloy, which has been suddenly cooled down from a red heat, evidently shew that, at a temperature not sufficiently high to produce fusion, the mixture undergoes another change as to proportions; as it forms a combination of a more fluid nature than a compound containing more tin and less copper; which compound is destroyed by slow cooling,—but which still exists on cooling quickly in water, as the alloy solidifies too quickly to allow the primitive general combination of the two metals again to take place. These modifications do not present themselves in all alloys wherein copper greatly predominates, because their great fluidity renders a change in their properties impossible.

On the same principle, in an alloy consisting of 100 parts of tin and 400 of copper, the primitive general combination of the two metals is completely re-formed by cooling slowly from a red heat. These changes in the proportions, owing to a difference in the degree of temperature and the method of cooling the heated mass, perfectly explain why this alloy behaves, as regards ductility under the hammer, at a red heat, exactly in the same manner as after sudden cooling; and also why this slowly-cooled alloy, and that which was not carried to a red heat, are both brittle, and will not work under the hammer.

On increasing still further the per centage of copper, by combining, for instance, 100 parts of tin with 1,100 parts of copper (which proportions are usually employed for gun metal), properties of a totally different nature are presented. By very slowly cooling the alloy in a state of fusion, it appears to the naked eye perfectly homogeneous; but on applying a lens, the faces of a recent fracture will lose this appearance, and a white metallic alloy will be seen to have been detached in the midst of the reticulated facets of another alloy, of a reddish-yellow color. On being wrought and polished, the surface however appears homogeneous, as the tenacious reddish-yellow alloy prevents the white friable compound, which is dispersed in small grains throughout the mass, from being apparent.

On causing a sudden cooling or solidification of the fluid alloy, in the form of small ingots, by pouring it into an iron ingot-mould as thick as possible and in a cold state, a homogeneous combination is formed, the fracture of which does not present any heterogeneity; the alloy therefore remains as homogeneous as in the fluid state. If the ingot be heated to an intense and con-

tinuous red heat, and in that state be plunged into water, it retains its homogeneous character; whilst, if cooled very slowly in the air, it acquires the property of the liquid alloy slowly cooled in the air; that is to say, a granular white compound is produced, which is deposited in the midst of a reddish-yellow reticulated mass. This compound, cooled slowly, behaves in exactly the same manner at a sustained red heat. If plunged into water at a red heat, it is homogeneous;—if slowly solidified, it preserves its heterogeneity.

An alloy composed of 100 parts of tin and 1,100 parts of copper can only be homogeneous at an elevated temperature; that is to say, at the temperature of fusion, or at an intense red heat.

If the temperature be lowered, at least two combinations are formed,—the compound which is thus solidified being a mixture of two compounds, having definite chemical proportions:—their formation may be prevented by sudden cooling. This metallic mixture, on being heated, behaves in a very different manner from d'Arcet's alloy; and this difference is a consequence of the change in the proportion of the tin to the copper; which proportion, in d'Arcet's compound, is sufficiently considerable to cause the former metal to remain united with the copper at any temperature; but, at a red heat, gives rise to two combinations, which destroy each other, both at the temperature of fusion and at the ordinary temperature. The alloy, constituting gun-metal, contains so little tin, that the two metals require to be at the temperature of fusion, or at a very elevated temperature, to remain in combination; on lowering the temperature, they will separate, and this can only be prevented by sudden cooling. Cannons, cast in gun-metal, do not, therefore, any more than cast-iron guns, consist of two metals, in chemical combination, but of a mixture of, at least, two compounds of copper and tin, mechanically set, as it were, into each other. An alloy, consisting of 100 parts of tin and 1100 parts of copper, could not therefore be a homogeneous compound, unless it were possible to cool and solidify the fluid mixture momentarily, or to expose the castings, after having been slowly cooled, to a red heat, and then cool them suddenly in water. But these two methods are impracticable, by reason of the great bulk of the castings; the only practicable method being, to allow the pieces to cool slowly in the mould. If the substance of which the mould is formed is an excellent conductor of heat, then the compound, which has lost much of its fluidity, is quickly brought to the solid state, and an instructive phenomenon takes place; which is, that after the metal has coagulated in the mould, the compound possessing the greatest degree of fluidity rises, and boils in the "gate." Instead of contracting, on solidification, this compound appears rather to expand, as it is seen to rise in the mould. On examining the condition of a piece of cannon, thus cooled, it will be found that the surface of the fractures is full of holes and bubbles, and that the piece is not fit for service. M. Karsten states that he found a dilated alloy of this kind, which

was of a white color, and very brittle, composed of 21 parts of tin and 79 of copper.

If the moulding sand be surrounded, as is now done in the new processes of casting, with cast-iron moulds, these latter acquire a very high temperature after running the metal; and as soon as the above-mentioned phenomenon of the rising of the most fluid portion of the alloy takes place. But if the old method of moulding in clay be adopted, or if a substance be employed in the mould of as low a conducting power, and as dense and little porous as possible, the iron mould will not become heated, and the metal will shrink and coagulate without this phenomenon taking place; the alloy will remain fluid during a much greater length of time; so that the least fusible compound will not solidify at the moment of moulding, but will remain in combination with the more fluid and still hot portion; from which results a more regular deposit of the alloys one upon the other. These two alloys may be very distinctly seen with the naked eye, on examining a recent fracture.

The chemical composition of the least fluid combination cannot be easily determined, as it is impossible to separate the red and tenacious compound from the white and brittle one with which it is intermixed. The latter compound may however be obtained in a state of purity, as by reason of its greater fluidity it is separated in the mould when the less fluid portion solidifies, so as to be free from all mechanical mixture. It is white, hard, and brittle, and has received the name, from German casters, of *krätz métal* (waste metal): M. Karsten found its composition to be 17·7 parts of tin and 82·3 parts of copper.

A variety of easily fusible compounds of tin and copper, possessing definite proportions, are therefore capable of formation, in which the per centage of copper augments proportionably to the speed at which the cooling is effected. Under these circumstances it may be well to explain the fact, which the experiments of artillery officers have proved, viz., that pieces of large calibre are not so durable as those of less calibre, although the composition of the alloy, and the operation of moulding them, may have been the same. The bore of pieces of large calibre is of softer metal, and consequently increases in diameter more rapidly by use than those of smaller calibre; because the large pieces necessarily take a much longer time in cooling, and the more fluid part of the mass, formed in this slow cooling, contains less tin, and is consequently softer than the alloy which is as fluid but is more rapidly cooled. These phenomena also lead to the following result; viz., that not only are the combinations of the alloys determined, in many cases, by differences of temperature; but also the compounds, already formed, may undergo a change, by merely raising the temperature, without its being requisite to bring the compounds to a fluid state, and without any disengagement of gaseous matter. —[*Technologiste.*]

ON A PHENOMENON CONNECTED WITH THE EXPANSION OF LIQUIDS.

BY M. M. BERTHELOT.

If a strong glass tube, closed at one end, and drawn out to a capillary opening at the other, be filled with water at the temperature of 28° or 30° Cent., and then cooled down to 18°, a small space will be formed above the liquid, into which, air will enter through the capillary opening. If the tube be now hermetically sealed, and then again heated up to 28°, and gradually even above that point, the liquid will expand to its normal bulk, and the bubble of air enclosed above it in the tube will soon be completely dissolved and absorbed. If the tube and liquid be now again cooled down to 18° (the temperature at which the capillary opening was sealed, and at which there existed in the tube both water and air), it is remarkable that the water does not contract, but continues to occupy the whole of the capacity of the tube, and preserves a uniform density from 28° down to 18°; indeed, the temperature may be brought still lower without producing any diminution in the bulk of the water, unless the tube be suddenly jerked, or in any way made to vibrate,—in which case the bubble of air dissolved in the water will suddenly be liberated with a kind of effervescence; it dilates rapidly, and in a few seconds re-acquires the same bulk it normally possessed at the temperature of 18°.

Similar observations to the above have been made with the following liquids:—Water, solutions of gases and various salts, a solution of soda, acids of different kinds, alcohol, ether, acetone, Hollands spirit, essence of turpentine, olive oil, creosote, sulphuret of carbon, chlorides of the metalloids and of the metals, and bromine. Mercury is the only liquid which has not given the same result,—a bubble of air remained in the tube with mercury during several days without becoming absorbed, at least, completely; although a pressure of from 200 to 300 atmospheres was produced. In this phenomenon, there exists two distinct circumstances; in the first place, there is an unstable state of supersaturation of the liquid by the quantity of air absorbed under pressure: of this condition we have many examples;—it is one of forcible expansion of a liquid which, at one period in the experiment, occupies the same space which the air and water had before occupied conjointly, and which originally was occupied by the water alone under an increase of temperature to the extent of 8°, or 10°, or more. Secondly, the difference of density, thus produced, is very great;—for water, it amounts to $\frac{1}{420}$ of its volume at 18°; for alcohol, to $\frac{1}{93}$; for ether, to $\frac{1}{59}$:—such an effect is not produced, inversely, excepting by a pressure of 50 atmospheres for water, and 150 for ether. That this phenomenon is very general is proved by the number of liquids which have been experimentally shewn to manifest it: it no doubt always accompanies the state of supersaturation, although in variable degree, and without being always susceptible of proof. An attempt was made to produce the expansion of liquids on the above principle in vacuo. An apparatus, contrived for the pur-

pose, enabled the tubes to be filled with liquids perfectly freed from air, and to be sealed without suffering any trace of air to find entrance. Under these circumstances, the phenomenon of forcible expansion was produced with water and ether, and was shewn to be independent of the state of supersaturation. The permanent density of fluids through an interval of temperature, more or less extended, appears to be due to a kind of adhesion between the glass and the liquid: this is a force which is opposed to the division of the latter, and one which can only be destroyed by increasing the attraction of the molecules of the liquid for each other,—an effect which may be produced by the influence of cold.

GUTTA-PERCHA VARNISH.

A VARNISH of a very adhesive quality, and completely resilient to moisture, may be prepared with essential oil of resin and gutta-percha. Three parts by weight of gutta-percha of commerce are put into a vessel containing nine parts of raw essence of resin, obtained by the destructive distillation of ordinary resin; and this mixture is submitted to a temperature of from 50° to 60° Centigrade,—stirring from time to time until all the gutta-percha is dissolved. The varnish thus prepared is well adapted for coating ordinary articles, such as waterproof coverings for waggons, tarpauling, &c.; but in order to obtain a varnish suitable for superior articles, the essence is rectified by passing a current of steam through the raw oil until the condensed product distilled acquires a specific gravity of about 0·870, at which point the distillation is stopped, as all products having a greater specific gravity would be injurious to the quality of the essence.

A colorless varnish may also be manufactured from essential oil of resin and damara resin or mastic. Rectified essential oil of resin, prepared as above, is mixed with from $\frac{1}{10}$th to $\frac{1}{6}$th of its weight of sulphuric acid, of a specific gravity of not less than 1·700, and the mixture is agitated, and the essence again rectified by means of a current of steam: by which means a colorless oil is produced. In this state, damara resin or mastic is dissolved in four times its weight of this rectified essence by a gentle heat.

A varnish of inferior quality may be obtained by employing essence which has only been once rectified, and which has not been treated with sulphuric acid.

The proportions of all the ingredients may be varied according to the quality and the nature of the varnish desired to be obtained.

THE SUBMARINE TELEGRAPH.

THE importance which naturally attaches to the submarine telegraph, not merely as a scientific curiosity, but as respects the changes it is likely to effect in the social relations of mankind,

claims for the record of the temporary failures, as well as the successes of its projects, a degree of interest far surpassing that which novel undertakings in science are generally found to elicit. We propose, therefore, as a follower to the announcement contained in our last number, of the establishment of a telegraphic communication across the Straits of Dover, to record, from time to time, the passing notices which may appear in the daily and other journals of the progress of this novel undertaking, until a permanent and efficient line of communication is satisfactory completed. In accordance with this view, we now give a translation of a letter addressed by the projectors to the *Journal des Débats*, and also an account from a correspondent of the *Times*, from which a correct notion of the proceedings to the present time may be gathered.

From the Journal des Débats.

The general interest attached to the success of our experiments during the last week, relating to the submarine electric telegraph, induces us to request you will be good enough to give notice that the telegraphic communication between France and England is temporarily suspended, in consequence of injuries sustained by the wire from friction upon the rocks at Cape Grinez. This circumstance is however of minor importance, as the communication between Dover and Calais will be completed very shortly.

The knowledge which has been acquired of the nature of the bottom upon the coast of France, and the difficulties which it presents, will render it comparatively easy to avoid such an accident for the future, by choosing a suitable place for the laying down of the wire.

The possibility of establishing a communication between the two coasts having been demonstrated beyond all doubt, everything will be shortly repaired, and the two greatest nations in the world will thus be definitively and for ever united.

JACOB BRETT, FRANCIS EDWARDS,
CHARLTON J. WOLLASTON,
Dover, 4*th Sept.*, 1850. *Directors of the Company.*

From the Times Correspondent.

Since the sinking of the first wire, circumstances have occurred calculated for a short time to retard the carrying out the project to completion, seeing that, in order to the complete establishment of an integral line of telegraphic service between London, Paris, and the Continent, the promoters have to obtain a grant from the French Government of the 18 miles of line extending from the coast to Calais, from which point to Paris the wires are erected. To secure that concession of this section, in the way of which some difficulties presented themselves, Messrs. Brett, Wollaston, and Edwards, directors of the undertaking, are now at Paris,

awaiting the return of the President of the Republic, who granted the original decree, and to negotiate with the government authorities on the subject.

In the mean time, experience of the experiments already made goes to prove that a stronger species of telegraphic tackle will be required. By the terms of contract with the French Government it was enacted, "that the government does not reserve to itself the right of making any similar concession," but, "that in case the experiment does not result in a favorable execution by the 1st September, 1850, the right conceded will revert to the French Government." Consequent on the conditions laid down in the contract the promoters successfully submerged the wire; but, as is well known, it was subsequently cut asunder by some rocks on the French coast.

Since this happened divers have been down, and, on examination, it has been found that where the rupture of the coil occurred it had rested on a very sharp ridge of rocks, about a mile out from Cape Grinez,—so that the leaden weights, hanging panier-like on either side, in conjunction with the swaying of the water, caused it to part at that point; while at another place in-shore the shingle from the beach had the effect of detaching the coil from the leaden conductor that carried it up the Cape. The wire in its gutta-percha coating was consequently cut in two places, representing a remnant of wire, of about 400 yards, which was allowed to drift away, till it came into the possession of a fisherman at Boulogne, who made a demand of 60f. for the injury he alleges it did to his nets. Complaints are made by the fishermen, both on the English and French coasts, that the existence of this wire will interfere with their deep sea fishing, and that its track over the Varne and elsewhere is in the way of places most frequented by fish. It is intended, however, at the suggestion of Mr. J. W. Brett, to pay these people an annual rental, and to establish for their families a philanthropic fund, to induce them to unite in the protection of a great national enterprise. The assistance of the Admiralty has also been secured for the issue of prohibitory orders against fishing on the route of the electric sea line, and against ships dropping or dragging anchors over its site. The authorities of Calais and Boulogne have intimated that they will send drummers round the town to advise fishermen not to fish on these spots; and the company will apply for powers to punish as a misdemeanour any attempts at injuring the wire. The line of wire, where it was dislocated, is now securely fastened on to the end of a large buoy. Her Majesty's ship Widgeon, with Captain Bullock, has traversed the rest of the track, fishing up at intervals the whole of the sunk wire out of 100ft. and 150ft. of water, and laying it down again,—thus proving that it has not drifted, and that there were no currents to remove it.

The promoters of the project appear to be fully apprehensive of the inadequacy of the present arrangements, and all their

ingenuity is at work to be prepared to meet the emergency. Of currents it may be stated that there is no fear, since it has been ascertained that at certain fixed depths, even in the rapids of the Mississippi or at the Menai, there are none below three or four fathoms, and that at five fathoms there is calm water. In order to meet all existing or conjectured difficulty the character of the undertaking, so far as its magnitude and solidity are concerned, will now be altered. The electric wire, thin as a lady's staylace in itself, will now be encased either in a 5 or a 10-inch cable (the diameter of those that placed the Britannia tubes in position), and this will be submerged by the aid of enormous weights. The wire will be imbedded in this gigantic coil or cable, composed of what is called whipped plait with wire rope, all of it chemically prepared, so as to protect it from rot, and kyanised: the whole to be chained down, as it were, as the rails are on a railway, by the gravitation of the huge weights in the bottom of the sea.

Dover, Sept. 15th.

TELEGRAPHIC COMMUNICATION COMMERCIALLY CONSIDERED.

We are indebted to a recent number of the *Times* for the following tribute to the enterprize and just appreciation of modern inventions displayed by the citizens of the United States. The strain is novel considering its source; but it is not the less true from that circumstance. The burden of the article is to shew the impolicy of the extravagant charges made for telegraphic communications in this country,—a matter which is of great importance to the newspaper proprietors, and is not without interest to the community generally. We trust that the incorporated monopolists of this wonderful invention may be brought to see that their speculation and the convenience of the public may be simultaneously consulted with advantage.

The Ohio, Indiana, and Illinois Telegraph Company, we are told, has already one thousand miles of line in working order, and this through a country covered, not with human dwellings, but dense and almost impervious forests; thus exhibiting another and a striking instance of the mode in which the latest discoveries of modern science are made subservient to the wants of communities at the very commencement of their existence. Half a century since, wild beasts, and still wilder Indians, wandered over the lands now traversed in perfect security by these frail wires, the mysterious agents by which human thoughts and desires are made to travel, in fact, as rapidly as they are conceived. This transition from a wild and barbarous condition to that of the most elaborate civilisation has not been gradual, but instantaneous. Civilisation has not here at first dimly dawned, then slowly ad-

vanced, gradually working its way against opposing difficulties to its ultimate perfection,—but has at one bound leaped into life, surrounded with every appliance and means which the existing knowledge of man has devised for ministering to his wants and his enjoyment. The railroad and the electric telegraph, the steam engine with all its multiplied variety of uses—in mills, in boats, on rivers and canals, and in ships on lakes that in fact are inland seas—every sort of machinery, every chemical discovery, all practical discoveries, in short, have been immediately adopted, improved upon, and to the very utmost employed in these new States, all of which have been founded within the memory of living men; and in nothing has this immediate application of novel arts been more manifest than in the use of the electric telegraph. Let any one place before himself the map of the United States, and trace the distance that intervenes, for example, between the cities of New York and Cincinnati; and then let him regard the character of the country all along that extended line—the boundless forests, the wide, deep, and numerous rivers, the lofty mountains, that must be traversed by the wires which connect the two cities we have named. Again, from New Orleans to New York the route is just as difficult; yet here again we see that the obstacles have not prevented communication, and to our astonishment we discover that there is a more rapid and continued correspondence between people residing in Louisiana, New York, and Massachusetts, than between London and Bristol. Is there not here cause for wonder and regret?

When we remember that the discovery thus employed was made in England (?)—that the people of England have quite as great a need of rapid intelligence as those have who dwell in America—that we have greater wealth and equal intelligence and energy—we are driven to ask, Why have we not made the same use of this great invention? We may be told that the enormous distances at which people live from each other in the United States is the one great reason for their general adoption of the means of communication afforded by the telegraph. Undoubtedly, the difficulty of travelling and of personal communication does enhance the value of the discovery. But the distance must greatly increase the cost, and the thinness of the population must tend to diminish the return to the outlay of capital. In such circumstances we should therefore expect that the charges upon communication would be proportionally great, and that, in England, where the distances are much less, and the population much more dense, the number of communications would be very much larger in proportion to the sum expended or the miles of line laid down, and the sums charged upon communication much less, than those of America. Yet the very reverse of this takes place. The charges are very small in the United States, and as a consequence the communications are very numerous,—and thus the frequency of the use pays for the greater expense of the lines; and herein we suspect lies the cause of our neglect of this

instrument of communication. The post travels rapidly, is cheap, and the communication therefore between persons living at no very great distance apart is sufficiently easy and expeditious to make us unwilling to incur a very heavy cost, even for a more rapid means of correspondence. If, however, this more rapid means were also very cheap, the use would become a habit, and the frequency of the employment of the telegraph would quickly repay its outlay. In fact, the principle of small and frequent returns would hold good in this instance as in so many others, and our telegraph adventurers have hitherto partially failed, because they have made their communication far too costly.

TRANSACTIONS OF THE INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

The following paper by Mr. SHIPTON, of Manchester, was next read:—

On a new reciprocating steam-engine.

The subject of the present paper is a steam-engine of the reciprocating class, but differing from the ordinary engine in the means adopted for obtaining the revolving motion direct out of the rectilinear. The principle of obtaining the power is the same as in the ordinary reciprocating engine, viz.—a piston acted upon by steam is propelled in a rectilinear direction in a cylinder or steam chamber, which in the present case is square or rectangular, instead of circular.

From the many unsuccessful attempts to obtain a continuous motion direct from the piston, it is the author's wish to disclaim all connection between this invention and rotary engines, but to shew that it is simply a short stroke reciprocating engine;—the germ being "an excentric revolving in its own diameter," which is nothing more or less than the piston and crank combined in one body, and this body containing in itself two distinct motions, viz.—rectilinear and revolving motions, both of which are common to the ordinary engine.

It has been the inventor's endeavour, firstly,—that the power of the steam should be conveyed to the main shaft or axle in the most direct and simple manner (taking the oscillating engine as a fair example); secondly,—to construct such an engine that it may with safety be worked up to an extraordinary number of revolutions, without causing the piston to travel through an excessive amount of space; thirdly,—to arrange such a plan that the steam may be used expansively, without inconvenience and complexity of parts; fourthly,—to take care that no amount of the piston's surface should be in rubbing contact, except that which is the real effective portion under the action of the steam (which the author considers is only the case with the common cylinder and piston-engine, and the one under notice, and hence the excess

of friction in most of the former modifications); fifthly,—to form certain parts of the engine to act as fulcrums to the moving parts, so that the whole lifting power may be self-contained, and thereby secure a steady, fixed, and uniform motion; sixthly,—to provide against any excess of wear of one part more than another, and to admit of all parts, both internal and external, being easily repaired, or even replaced, without renewing heavy parts of machinery, such as cylinders, &c.; also that no crooked forms and contrivances need be resorted to, to bring back the first motion into a safe and useful form, such as guides and cross-heads, or parallel motions, or even a piston rod, giving out its power at a considerable angle when the crank is most effective; thus altogether depending upon the length of the connecting rod,—the evil of using short rods being generally admitted.

Having thus briefly described the views of the inventor, the author will proceed to shew the analogy which this engine bears to the piston and crank of the ordinary engine,—reference being had to fig. 1, in Plate IX. In this figure, *a,* is the crank of an ordinary engine, on the shaft *c,* in full power, or in the most effective position; and the whole power is conveyed through the line *h,* at an angle varying according to the length of the connecting rod and the position of the crank.

It is the author's opinion that, if steam could be brought to bear upon the crank direct, it would be a more simple and ready means than at present in use; and, for the sake of illustration, suppose *a,* (fig. 1,) is a crank, filling up completely between the sides of the steam-chamber *e,f.* When steam is admitted on the top of the crank *a,* as indicated by the arrows, it will move into the position shewn by *b*; but in that position it must be observed, that the same crank would be too short to fill up the steam-chamber, and, consequently, the steam would rush by the end *d.* It therefore becomes necessary to change the form of the crank, and to make it such, that at every position the space between *e,f,* may be filled by it; which form at once resolves itself into the circle *g, g,* with the shaft or axle *c,* passing through it out of the centre,—thus far resembling the common excentric; and it will be seen, that when steam is brought to bear upon its entire surface, as shewn by the arrows, it is thereby propelled bodily into the dotted position *i, i,* and, from the fact of being an excentric, a revolving motion is obtained during its propulsion,—and here are the piston and its appendages and also the crank of the ordinary engine contained in one body.

It is immaterial on what form of piston the steam acts in case of bodily propulsion; and, for the purpose of illustrating this subject further, suppose the shaft or axle and crank to be dispensed with, and the steam to act upon the circle *g, g,* as shewn by the arrows: this circle, or body, would be propelled in a rectilinear direction only, which would have to be converted into a revolving motion in the ordinary manner, and through a number of parts. It therefore becomes a question whether the

rectilinear and revolving motions common to the ordinary engine cannot be advantageously blended together in one body.

Figs. 2, and 3, Plate IX, shew transverse and longitudinal sections of the engine. *a*, is a steam-chamber, which serves the purposes of a steam cylinder, and therefore will be so denominated in the following explanation. This cylinder, which is of cast iron, has a plate *e*, fitted fast to it, and also a plate *d*, fitted loose in a parallel recess, but sufficiently accurate to prevent any escape of steam. The plate *d*, is for the purpose of following up the piston as it wears, and is adjustable to its work by means of springs behind it, or by the admission of steam by a small steam pipe,—the former mode being preferable. This plate also answers another purpose—in cases of priming, the water in the cylinder forces back the plate, and rushes from one side to the other of the piston until it escapes.

The circular ends of the cylinder are left black and unbored, as it will be seen that the periphery of the piston does not come in contact with any other part of the cylinder but the two plates *d*, and *e*, and consequently the tedious and costly operation of boring the cylinder is entirely dispensed with. The plates *d*, and *e*, on which the wear takes place in the cylinder, are easily replaced at any period, and can be removed without taking any of the rods off, by simply pushing the side plates *l*, *l*, on one side. These plates *l*, *l*, are planed surfaces, against which the piston ends rub, and the joint to the cylinder is metallic. It will be noticed that these plates have holes or slots in them of a peculiar form, which are for the purpose of getting them over the cranks *g*, *g*, though a slot of sufficient size to allow the shaft *c*, to traverse clear would do, if this were not the case.

The piston *b*, is an excentric, keyed on the shaft *c*, which is carried by the rods *f*, *f*, vibrating from the crank-shaft pedestals. This piston is turned true on the periphery, and in each end are turned conical seatings, into which are fitted rings of metal *k*, *k*, cut open on one side, and leaving a lap-joint, to prevent any escape of steam. The rings are each under the control of a bolt, and can be adjusted through the slots in the side plates *l*, *l*, without removing a single nut, and thus are easy of access:—the peculiar wear and the means adopted for obtaining a steam-tight joint are worthy of notice, and will be described hereafter.

The cranks *g*, *g*, are keyed on the shaft *c*, at right angles to each other, and equidistant from a line drawn through the centre of shaft and centre of the piston; and through these cranks the power is merely conveyed through the rods or drag links *h*, *h*, to the lower crank *i*, *i*, on the main shaft; but these cranks can be keyed on at any other angle, as they only transmit the power, and consequently can be of any suitable length, independent of the stroke of the engine.

It will be seen that the vibrating rods *f*, *f*, are carried on the pedestals *j*, *j*, which have a gudgeon turned in the centre, on which the rod vibrates; so that all the wear that takes place on

this bearing is caused by the vibration of the rod, which is very slight.

Steam is admitted by means of a valve *n*, through the steam-ports or ways *m, m*, to the top and bottom of the piston alternately, the same as in the ordinary engine. Though the construction of the valve shewn here is peculiar, yet an ordinary slide-valve would answer the purpose. This valve is on the equilibrium principle, and exhausts through the back, and works between two parallel planed surfaces;—the wear that takes place being accommodated by a ring of metal *o*, similar to that employed for packing the end of the piston. The peculiar advantages of this valve consist in its being light and easy, and therefore suitable for high speeds, having a ready exit for the exhaust steam, and being simple in construction. It is worked by an excentric *q*, keyed on the crank-shaft *p*, and by levers, weigh-shaft, &c.

The cylinder is bolted down to a framing, and the entire engine is placed on a foundation-plate, and fixed in the ordinary manner.

The mechanical difficulties encountered in this engine were the keeping the piston steam tight, and also the peculiar wear at the periphery and ends of the piston. It will be seen, that should there be an escape of steam, it will readily be perceived issuing out of the slot holes in the side plates *l, l*. The piston ends are made tight by rings of metal *k, k*, fitted into a conical seating as before described. These rings are cast open and drawn together by a bolt after the joint is filed square; and it entirely depends upon this joint whether the ring be steam-tight; as, if it be not true, the ring will be drawn out of its natural shape, and when released, after it has been turned true, it will spring back to its own shape: therefore it is preferable to file the joint in such a manner that the ends of the ring may have a tendency to spring outward, and thus the difficulty is removed. It will be seen that the motion on the piston ends is an elliptical one; and, from the fact of the rings being disconnected with the piston, they are at liberty to move in their seating, and the peculiar motion, viz., ellipses of all sizes, varying according the proximity to the centre on which the piston turns, causes the rings slowly and gradually to traverse round in their seatings,—thus accomplishing a most desirable object, that no two surfaces go over the same lines twice together.

The periphery of the piston has likewise a beautiful wear, as it will be seen that, at the same time it is revolving, it is passing up and down the plates *d, e*, the length of the stroke; and from this motion excessive wear is not anticipated.

The following paper, by Mr. THOMAS THORNEYCROFT, of Wolverhampton, was then read:—

On the form of shafts and axles.

The author of this paper, being a manufacturer of railway

axles, has had his attention drawn to the subject of the form of axles for some considerable time; and from his knowledge of the properties of iron, and his observations of the fractures of shafts and axles, he has concluded that various forms of shafts and axles possess elements of self-destruction—that the fractures which take place are generally confined to given parts — and that those parts where fracture takes place exhibit errors of mechanical construction, or errors of mechanical arrangement, when in motion.

A very extensive course of experiments has been gone through by the author, approximating as closely as possible to the forces on axles when in use; and these have satisfied his mind that just in proportion as there are departures from certain fixed principles of construction in either shafts or axles, in the same proportion will be their liability to fracture.

Before passing to an examination of the experiments, it may assist to a more correct elucidation of the subject, if the railway axle is viewed as having certain relations to a girder in principle. Girders generally have their two ends resting on two points of support, and the load is either located at fixed distances from the props or dispersed over the whole surface; and just so is it with the axle, for it has its points of support and its loaded parts; but it is not clearly evident which are the loaded parts and which the props. It has been stated that the wheels may be considered the props, and the journals the loaded parts; but it is thought that with equal propriety the journals may be considered the props, and the wheels the loaded parts. If this latter opinion is at all admissible, we then have the load brought much nearer the centre of the axle than in the case where the journals are considered the loaded parts; and, besides, it brings more immediately before us the influence which the inclined bearing surface of the wheels will necessarily have in increasing the power of any lateral or vertical blow which the axle will receive through the wheels. It is found that the inclined surface of the wheel tire ranges from 1 in 12 to 1 in 20, and, as a matter of course, the direct tendency of the wheels under a load is to descend that incline; so that every vertical blow which the wheels may receive is compounded of two forces; viz., the one to crush the wheels in the direction of their vertical plane, and the other to move the lower parts of the wheels together. These two forces have a direct tendency to bend the axle somewhere between the wheels; and should that yielding or bending extend no farther than one-half the elastic limit, and be long continued, a fracture will ultimately take place; but should the elastic limit be exceeded, the axle takes a permanent bend—the wheels are then diverted from their vertical plane, and, as a matter of course, leave the rails. To demonstrate this was the object of the first experiment. An axle, reduced in the middle to $1\frac{3}{4}$ inch diameter, was placed upon two props, 4 feet 9 inches apart, and loaded in the middle: the

utmost of its deflection, without a permanent set, was ·232 inches; the load carried 7 tons. An axle, reduced to four inches in the middle, was then placed upon the props, 4 feet 9 inches apart: its utmost deflection, without a permanent set, was ·281 inches; the load carried 9 tons. Another axle, but parallel, $4\frac{5}{16}$ inches diameter, was placed upon the props, 4 feet 9 inches apart: its utmost deflection, without a permanent set, was ·343 inches; the load carried 14 tons. Hence, by reducing an axle of $4\frac{5}{16}$ inches diameter in the middle to $3\frac{3}{4}$ inches, its limit of elasticity is reduced from ·343 inches to ·232 inches; and the load to produce that elasticity from 14 to 7 tons. In Plate IX., fig. 4, shews the position of the wheels to the rails, when the bending of the axle has exceeded its elastic limit.

The object of the second experiment was to ascertain what influence the reduction of an axle in the middle would have on its strength to reduce sudden impact, compared to an unreduced one: this axle was made as represented by fig. 5, which shews the end *a*, parallel to the centre $4\frac{1}{2}$ inches diameter; and the end *b*, is drawn down from the back of the wheel towards the centre, where it is 4 inches diameter. The end *a*, was then subjected to impact—the relative position of prop and ram was the back of the wheel and the neck of the journal: this end received 46 blows of the ram, and bent to an angle of 18°. The end *b*, was then subjected to impact—the prop and ram in the same relative position; when it bent back to an angle of 22° with only 16 blows of the ram, as shewn by the dotted lines in the figure. The object of the third experiment was to ascertain what influence a shoulder behind the wheel would have on the strength of the axle at that part, compared to one without a shoulder. Figs. 6, and 7, were one axle cut in two; the end *e*, was turned from the neck of the journal, leaving a shoulder $\frac{1}{8}$th inch deep, as a stop to the wheel; the end *f*, was turned from the neck of the journal to the same diameter, but no shoulder left. The end *e*, was subjected to hydraulic pressure, the load being in a direct line with the shoulder, when it broke in two with a load of 60 tons. The end *f*, was subjected in the same way to hydraulic pressure, when it bent into the form shewn by the dotted lines, with 84 tons. The object of the fourth experiment was to ascertain what influence the position of the wheel, in relation to the neck of the journal, would have on the strength of the journal under impact. Fig. 8, was a piece of an axle, with a journal taken down at each end: the end *g*, was keyed into a cast iron frame, the face of the frame being in a line with the neck of the journal. The journal was subjected to the impact of a ram falling 10 feet, and broke off at the 7th blow. The end *h*, was keyed into the cast iron frame in the same way, but with the neck of the journal projecting $1\frac{1}{2}$ inches from the face of the frame: the journal was then subjected to the impact of the same ram falling 10 feet, when it broke at the 24th blow.

From these experiments, and from the acknowledged deteriorating influence of vibration or bending on iron, especially when continued any great length of time, it is the author's opinion that neither shafts nor railway axles ought to be reduced in the middle, but rather, if there is to be a departure from the parallel form, they should be made thickest in the middle, and thus effectually prevent any vibration or bending whatever; for it is the introduction of this principle into almost every description of beam and girder, also into the connecting rods of every description of steam engine, and into a large quantity of the shafting now in use, that has rendered the whole of these articles so superior, in point of durability, to what they were when other principles of form were in use.

Mr. Thorneycroft gave a further illustration of the paper, by reference to several specimens of axles which were exhibited to the meeting. Having obtained an axle which had a shoulder at both ends, he turned the shoulder off one end, but left it on the other; and he found that in the instance where the shoulder was turned off, it required a pressure of 120 tons to break it, and $1\frac{1}{2}$ inch deflection; while the other end, where the shoulder was not turned off, broke with a pressure of 105 tons and $\frac{7}{8}$ of an inch deflection.

The Chairman observed that, as there was not time for the discussion of the paper at that meeting, it had better be adjourned to the next meeting,—more especially in the absence of their President, who took so great an interest in the subject.

Mr. Thorneycroft said, that between that time and the next meeting, he should be happy if any members of the Institution would visit his works, and test the truth of the positions advanced in his paper, and suggest any other experiments to investigate the subject.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1850.

Aug. 31. *William Elliot Carrett*, of Leeds, engineer, for a steam-pump.

31. *William Bird*, of 86, Oxford-street, London, for a boot.

31. *Michael MacManus*, of Blackburn, in the county of Lancaster, for "the parexograph," or self-acting copying guide, to assist in copying drafts, deeds, wills, or other documents or writings.

31. *David Hodge & Thomas Roberts*, of 101, Hatton-garden, London, for a candle-lamp for burning magnum candles.

Sept. 3. *John Tanner,* of 60, Broad street, Bristol, for cloth trousers.

3. *William Newman,* of Stafford-street, Wolverhampton, and *William Newman,* jun., of Henrietta-street, Birmingham, for "the imperial door-spring."

3. *Alfred Moring,* of 3, Artillery-place West, Bunhill-row, for "the Nepaulese braces."

4. *Leny D. Smith,* of 1, Little Knightrider-street, St. Paul's, for a coloring embossing apparatus.

6. *Hugh Booth,* of Swinton, in the county of Lancaster, mechanic, for a fork for the weft stop motion, used in looms or machinery for manufacturing woven fabrics.

7. *William Craig & Isaac Whitesmith,* of Glasgow, machinists, for a brake for slubbing and roving frames.

9. *Lewis Cooke Hertslet,* of Fitzroy-park, Highgate, for a double socket joint, for connecting tubes or pipes without flanges.

9. *Lamen Zox,* of 84, Long Acre, London, for a cape or cloak, with hood, for travelling or walking.

9. *James Isaacks Sands & Henry Edward Outtram,* of 19, Holborn-hill, for a pair of self-supporting trousers.

10. *George Wolstenholm,* trading under the style or firm of George Wolstenholm & Son, carrying on business at Washington Works, in the parish of Sheffield, in the West Riding of York, for George Wostenholm and Son's doubly-carbonized IXL razor.

12. *Thomas Honnor,* of 67, Leadenhall-street, City, for "the Utilis over-coat."

12. *Henry Phillips,* of 68, Graham-street, Birmingham, county of Warwick, manufacturer, for an improved shield for brooch-pins.

13. *Enoch Oldfield Tindall & Larenzo Tindall,* carrying on business under the style or firm of E. O. & L. Tindall, of Scarborough, in the county of York, ironmongers, for a cooking-range.

16. *H. J. & D. Nicoll,* of Regent-street, London, for a wrapper cloak.

16. *Charles Roper Mead,* of 3, Charlotte-cottages, Arthur-street, Old Kent-road, for a gas-meter.

17. *Edward Bing,* of Effingham-place, Ramsgate, carpenter and builder, for a window and door weather-joint.

17. *Thomas Boyle,* of Wolverhampton, for a trouser-strap.

18. *Joseph Welch & John Margetson,* of 17, Cheapside, London, for "the Cantab braces."

18. *Joseph Guise,* of 45, Clerkenwell Green, for "the Catoptric deflector and brackets for a gas-burner."

Sept. 18. *Richard Bright*, of Bruton-street, Westminster, lamp-maker, for a portable safety carriage-lamp.

19. *A. & W. Smith*, of Paisley, engineers and millwrights, for a centrifugal agitating churn.

20. *Alfred Keep & William Watkin*, of Stourbridge Forge, Stourbridge, for parts of a vice.

21. *Frederick Alexander Frinneby*, of 63, Cannon-street, City, for "the improved registered oval brush."

21. *H. J. & D. Nicoll*, of Regent-street, London, for inner lining or wadding for garments and other articles.

21. *Samuel Harrison*, of 52, Stanhope-street, Clare-market, smith, for a ventilator.

24. *John George Taylor*, of Great St. Thomas-the-Apostle, London, merchant, for a safety mount for fastenings.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th August to the 17th September, 1850, inclusive.

To George Gwynne, of Sussex-square, in the county of Middlesex, Esq,, for improvements in the manufacture of sugar.—Sealed 24th August.

Robert Reid, of Glasgow, in the county of Lanark, manufacturer, for certain improvements in weaving.—Sealed 27th August.

Richard Archibald Brooman, of Fleet-street, in the City of London, for improvements in types, stereotypes, plates, and other figured surfaces for printing from,—being a communication.—Sealed 6th September.

James Rennie, of Gowan Bank, Falkirk, in the county of Stirling, in the Kingdom of Scotland, Gent., for a certain improvement or improvements in the construction of gas retorts and furnaces, and in apparatus or machinery applicable to the same.—Sealed 10th September.

Peter Fairbairn, of Leeds, in the county of York, machinist, and John Hetherington, of Manchester, in the county of Lancaster, machinist, for certain improvements in machinery or apparatus for preparing, spinning, and weaving cotton, flax, and other fibrous substances; also in constructing and applying models or patterns for moulding, preparatory to casting parts of machinery employed in preparing, spinning, and manufacturing fibrous substances; and also in certain tools to be used in making such machinery.—Sealed 13th September.

George Thompson, of No. 12, Park-road, Regent's Park, in the county of Middlesex, Gent., for certain improvements in machinery and apparatus for cutting, digging, or turning up earth, applicable to agricultural purposes.—Sealed 14th September.

List of Patents

Granted for SCOTLAND, subsequent to August 22nd, 1850.

To Robert Westmoreland Hutchinson, of Camberwell, Surrey, for certain improvements in saw-sets, mallets, and other tools, and in apparatus and machinery for manufacturing the same.—Sealed 28th August.

James Hall, of Geecross, near Stockport, machine-maker, for certain improvements in looms for weaving.—Sealed 28th August.

Henry Houldsworth, of Coltness House, Lanarkshire, iron-master, for improvements in the manufacture of iron and other metals.—Sealed 28th August.

Charles Lamport, of Workington, ship-builder, for certain improvements in machinery or apparatus for lifting and moving weights, working chains, and pumping; which improvements are more especially adapted for ships' use.—Sealed 2nd September.

Astley Paston Price, of Margate, Kent, and James Haywood, of the Royal George Mills, Saddleworth, near Manchester, for improvements in filters.—Sealed 2nd September.

Frederick Woodbridge, of Old Gravel-lane, Middlesex, engineer, for improvements in machinery for manufacturing rivets, bolts, and screw blanks.—Sealed 3rd September.

Wakefield Pim, of Kingston-upon-Hull, engine and boiler-maker and builder of iron steam-ships, for certain improvements in the construction of the boilers and funnels of steam-engines.—Sealed 4th September.

Joseph Horsfall and Thomas James, both of the Mersey Steel and Iron Works, Toxteth Park, Liverpool, for improvements in the rolling of iron and other metals.—Sealed 6th September.

George Attwood, of Birmingham, copper roller manufacturer, for a new or improved method of making tubing of copper or alloys of copper.—Sealed 6th September.

Thomas Priestly, of Shuttleworth, county of Lancaster, manager, and Richard Hurst, of Rochdale, cotton-spinner, for certain improvements in machinery or apparatus to be used for preparing, spinning, and doubling cotton, wool, flax, silk, and similar fibrous materials; and also in machinery or apparatus for preparing, balling, and winding warps or yarns.—Sealed 7th September.

George Thompson, of No. 12, Park-road, Regent's-park, London, for certain improvements in machinery or apparatus for cutting, digging, or turning up earth, applicable to agricultural purposes.—Sealed 16th September.

Christopher Cross, of Farnworth, near Bolton, cotton-spinner and manufacturer, for certain improvements in the manufacture of textile fabrics; also in the manufacture of wearing apparel

and other articles from textile materials, and in the machinery or apparatus for effecting the same.—Sealed 16th September.

Joseph Long and James Long, of Little Tower-street, London, mathematical instrument makers, and Richard Pattenden, of Nelson-square, London, Surrey, engineer, for an improvement in instruments and machinery for steering ships; which is also applicable to vices and other instruments and machinery for obtaining power.—Sealed 17th September.

John James Greenough, of George-street, Hanover-square, London, for improvements in obtaining and applying motive power,—being a communication.—Sealed 17th September.

John Sidebottom, of Broadbottom, county of Chester, manufacturer, for improvements in looms for weaving.—Sealed 18th September.

James Scott, of Falkirk, shipwright, for improvements in docks, slips, and apparatus connected therewith.—Sealed 20th September.

George Robbins, of Forest Lodge, near Hythe, for improvements in the construction of railway carriages.—Sealed 20th September.

New Patents
SEALED IN ENGLAND.
1850.

To Sir John Scott Lillie, Companion of the Most Honorable Order of the Bath, of Paris, France, for certain improvements in the application of motive power. Sealed 5th September—6 months for inrolment.

John Saul, of Manchester, cotton-spinner, for certain improvements in machinery or apparatus for spinning and twisting cotton and other fibrous substances. Sealed 5th September—6 months for inrolment.

George Smith, of Manchester, engineer, for certain improvements in steam-engines, and also improvements in feeding or supplying the boilers of the same; part or parts of which improvements are also applicable to other similar purposes. Sealed 5th September—6 months inrolment.

William Watt, of the City of Glasgow, N. B., manufacturing chemist, for certain improvements applicable to inland navigation; which improvements or parts thereof are also applicable, generally, to raising, lowering, or transporting heavy bodies. Sealed 5th September—6 months for inrolment.

Andrew Barclay, of Kilmarnock, in the county of Ayr, N. B., engineer, for improvements in the smelting of iron and other ores; and in the manufacture or working of iron and other metals, and in certain rotary engines and fans, machinery or

apparatus as connected therewith. Sealed 5th September—6 months for inrolment.

William Erskine Cochrane, of Cambridge-terrace, Regent's-park, and Henry Francis, of Princes-street, Rotherhithe, for improvements in propelling, steering, and ballasting vessels; in the pistons of steam-engines, in fire-bars of furnaces, and in sleepers of railways. Sealed 5th September—6 months inrolment.

Frederick Woodbridge, of Old Gravel-lane, in the county of Middlesex, engineer, for improvements in machinery for manufacturing rivets, bolts, and screw-blanks. Sealed 5th September —6 months for inrolment.

John Beattie, of Liverpool, engineer, for certain improvements in steering vessels. Sealed 5th September—6 months for inrolment.

James Mather, the younger, of Crow Oaks, Pilkington, in the county of Lancaster, bleacher, and Thomas Edmeston, of the same place, calenderman, for certain improvements in machinery or apparatus for scouring, finishing, and stretching woollen, cotton, and other woven fabrics. Sealed 5th September —6 months for inrolment.

Christopher Cross, of Farnworth, near Bolton, in the county of Lancaster, cotton-spinner and manufacturer, for certain improvements in the manufacture of textile fabrics; also in the manufacture of wearing apparel and other articles from textile materials; and in the machinery or apparatus for effecting the same. Sealed 5th September—6 months for inrolment.

James Rennie, of Gowan Bank, Falkirk, in the county of Stirling, in the kingdom of Scotland, Gent., for a certain improvement or improvements in the construction of gas-retorts and furnaces, and in apparatus or machinery applicable to the same. Sealed 5th September—6 months for inrolment.

Pierre Erard, of Paris, for improvements in the construction of piano-fortes. Sealed 12th September—6 months for inrolment.

Robert Longdon, the younger, of Derby, glove manufacturer, and Thomas Parker Tabberer, of Derby, aforesaid, manufacturer of elastic fabrics, for improvements in the manufacture of looped fabrics. Sealed 12th September—6 months for inrolment.

Astley Paston Price, of Margate, in the county of Kent, chemist, and James Heywood Whitehead, of the Royal George Mills, Saddleworth, near Manchester, for improvements in filters.— Sealed 12th September—6 months for inrolment.

Thomas Lucas Paterson, of the City of Glasgow, North Britain, manufacturer and calico printer, for certain improvements in the preparation or manufacture of textile materials, and in the finishing of woven fabrics; and in the machinery or apparatus used therein. Sealed 12th September—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson & Co., of Fleet-street, London, patent agents, for improvements in purifying water, and preparing it for engineering, manufacturing, and domestic uses. Sealed 19th September—6 months for inrolment.

Henri Jeremy Christen, of Paris, engraver, for improvements in cylinder printing. Sealed 19th September—6 months for inrolment.

Jasper Wheeler Rogers, of Dublin, civil engineer, for certain improvements in the preparation of peat, and in the manufacture of the same into fuel and charcoal. Sealed 19th September—6 months for inrolment.

William Eccles, of Walton-le-dale, in the county of Lancaster, cotton-spinner, for certain improvements in looms for weaving. Sealed 19th September—6 months for inrolment.

Samuel Brisbane, of Manchester, pattern-maker, for certain improvements in looms for weaving. Sealed 19th September—6 months for inrolment.

James Nasmyth, of Patricroft, in the county of Lancaster, engineer, and John Barton, of Manchester, in the same county, copper-roller manufacturer, for certain improvements in machinery or apparatus for printing calicoes and other surfaces, and also improvements in the manufacture of copper or other metallic-rollers to be employed therein, and in the machinery or apparatus connected with such manufacture. Sealed 19th September—6 months for inrolment.

Henry Houldsworth, of Coltness House, in the county of Lanark, North Britain, iron-master, for improvements in the manufacture of iron and other metals. Sealed 26th September—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, Chancery-lane, mechanical draughtsman, for improvements in dyeing yarn; and in manufacturing certain woven fabrics,—being a communication. Sealed 26th September—6 months for inrolment.

Disclaimers and Amendments

OF PARTS OF INVENTIONS

Made under Lord Brougham's Act,—subsequent to September 1st, 1850.

Disclaimer filed the 11th day of September, 1850, with the Clerk of the Patents for England, by Robert Stirling Newall, of Dundee, Forfarshire, Scotland, whereby he disclaims certain parts of a specification of a patent granted to him on the 7th day of August, 1840, for "certain improvements in wire ropes and in machinery for making such ropes."

CELESTIAL PHENOMENA FOR OCTOBER, 1850.

D.	H.	M.	
1			Clock after the ☉ 10m. 17s.
	—		☽ rises 0h. 17m. M.
	—		☽ passes mer. 8h. 10m. M.
	—		☽ sets 3h. 53m. A.
	—		Occul. κ Leonis, im. 13h. 50m. em. 14h. 12m.
2			Occul. α Leonis, im. 1h. 52m. em. 2h. 47m.
	11	0	☽ in Perigee
5			Clock after the ☉ 11m. 30s.
	—		☽ rises 5h. 33m. M.
	—		☽ passes mer. 11h. 49m. M.
	—		☽ sets 5h. 52m. A.
5	2	56	Ecliptic conj. or ● new moon
	21	36	♀ greatest elong. 46. 40. E.
6	5	4	♂ in conj. with the ☽ diff. of dec. 5. 3. S.
8			Occul. η Libræ, im. 6h. 10m. em. 7h. 15m.
	3	16	☿ in inf. conj. with the ☉
	15	23	♀ in conj. with the ☽ diff. of dec. 8. 44. S.
10			Pallas stationary
	—		Clock after the ☉ 12m. 54s.
	—		☽ rises 11h. 36m. M.
	—		☽ passes mer. 4h. 1m. A.
	—		☽ sets 8h. 23m. A.
	16	53	♄ oppo. to the ☉
13	1	53	☿ in conj. with Vesta, diff. of dec. 5. 35. S.
	2	30	☽ in □ or first quarter.
	16	52	☿ in the ascending node
14			Occul. 19 Capricorni, im. 5h. 53m. em. 7h. 14m.
	—		Occul. 21 Capricorni, im. 10h. 1m. em. 14h. 14m.
	6	0	☽ in Apogee
15			Clock after the ☉ 13m. 53s.
	—		☽ rises 2h. 46m. A.
	—		☽ passes mer. 7h. 16m. A.
	—		☽ sets 11h. 49m. A.
	6	7	♀ greatest hel. lat. S.
16			Mercury R. A. 12h. 32m. dec. 2. 47. S.
	—		Venus R. A. 16h. 26m. dec. 25. 55. S.
	—		Mars R.A. 6h. 1m. dec. 25. 53. N.
	—		Vesta, R. A., 12h. 41m. dec. 0. 53. N.
16			Juno, R.A., 14h. 53m. dec. 7. 1. S.
	—		Pallas, R. A., 21h. 15m. dec. 2. 1. S.
	—		Ceres R.A. 0h. 15m. dec. 11. 42. S.
	—		Jupiter R. A. 12h. 29m. dec. 2. 1. S.
	—		Saturn R. A. 1h. 7m. dec. 4. 9. N.
	—		Georg. R. A. 1h. 47m. dec. 10. 26. N.
	—		Mercury passes mer. 22h. 50m.
	—		Venus passes mer. 2h. 48m.
	—		Mars passes mer. 0h. 35m.
	—		Jupiter passes mer. 22h. 48m.
	—		Saturn passes mer. 11h. 26m.
	—		Georg. passes mer. 12h. 6m.
	11	55	☿ stationary
18	6	7	☿ in Perihelion
19	18	17	♄ in conj. with the ☽ diff. of dec. 1. 54. N.
20			Clock after the ☉ 15m. 5s.
	—		☽ rises 5h. 14m. A.
	—		☽ passes mer. 11h. 45m. A.
	—		☽ sets 5h. 18m. M.
	11	3	♅ in conj. with the ☽ diff. of dec. 4. 35. N.
21	3	11	Ecliptic oppo. or ○ full moon
	14	32	♅ oppo. to the ☉
	—		Occul. *x* Ceti, im. 4h. 49m. em. 5h. 40m.
	—		Occul. B.A.C. 845, im. 14h. 7m. em. 15h. 20m.
22			Occul. *f* Tauri, im. 10h. 3m. em. 10h. 15m.
23			Occul. γ Tauri, im. 7h. 16m. em. 7h. 33m.
	—		Occul. 75 Tauri, im. 11h. 3m. em. 12h. 0m.
	15	8	☿ greatest elong. 18. 20.
24	2	3	♂ in the descending node
25			Clock after the ☉ 15m. 47s.
	—		☽ rises 8h. 3m. A.
	—		☽ passes mer. 3h. 11m. M.
	—		☽ sets 11h. 14m. M.
27	3	12	☿ in conj. with Vesta, diff. of dec. 3. 9. S.
28	4	59	☽ in □ or last quarter
	14	8	☿ greatest Hel. Lat. N.
29	4		☽ in Perigee
30	16	32	♃'s first sat. will im.

The Satellites of Jupiter are not visible until the 21st of the month, Jupiter being too near the Sun.

J. LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. CCXXVII.

RECENT PATENTS.

To Jerome Andre Drieu, *of Manchester, in the county of Lancaster, machinist, for certain improvements in the manufacture of wearing apparel, and in the machinery or apparatus connected therewith.*— [Sealed 1st August, 1849.]

This invention consists, firstly, in a peculiar mode of weaving certain fabrics into shapes suited for making up into coats, waistcoats, trousers, cloaks, and other similar articles of external clothing for men, and also into other shapes suited for making up into cloaks, mantles, and other external clothing for women; and, secondly, in certain peculiar mechanism capable of effecting the said object.

In Plate X., fig. 1, is a front elevation of a loom constructed according to this invention; fig. 2, is a top or horizontal view thereof; and fig. 3, is a vertical section, taken through the same in the line a, b. The various parts of the framework of the machine are shewn at *a, a, a*; the treadles at *b, b, b*; the reed and shuttle-box at *c, c*; and the healds or heddles at *d, d, d*. Instead of using a warp-beam, the patentee places the warp-threads upon a number of bobbins *e, e, e*, at the back part of the loom; which bobbins turn loosely and independently of each other upon axes *f, f, f*, extending across the machine, and supported in slots formed in upright bars *g, g, g*. Upon the bobbins *e, e, e*, are affixed pulleys *h, h, h*,—to the higher tier of which are attached and wound weighted cords *i, i, i*, which pass around the lower tier also, in order to keep the necessary drag upon the warp-threads.

From the bobbins *e, e, e,* the warp-threads are guided through a slea *k*; and from thence, after passing under a roller *l, l,* are conveyed between the two portions of a drag or clamp *m, n,* constructed in the following manner:—Extending from one side frame to another is a stationary bar *m,* on the upper side of which a cavity is formed, as shewn in fig. 3. The top part of the clamp is shewn at *n*; and it will be perceived, by reference to the drawing, that, on the under side thereof, there is a projecting rib, fitting into the cavity formed in the upper side of the bar *m.* The top part *n,* is formed in two pieces in the direction of its length, as shewn in fig. 2,—each portion thereof being mounted on hinges *o, o, o,* so as to be capable of turning upwards, as shewn by dots in fig. 3. To the hinder part of each portion of the clamp are attached rods *p, p,* which, at their lower ends, are connected to levers *q, q,* turning upon centres *r, r.* To the outward ends of the levers *q, q,* cords *s, s,* are attached, which, after passing under pulleys *t, t,* are connected, at the upper part of the machine, to levers *u, u,* which turn upon centres, as shewn in the drawing. The inward ends of the levers *q, q,* are provided with weights *v, v,* by means of which the upper parts *n, n,* of the clamp are pressed firmly down upon the lower portion thereof, when it is desired to hold back the warp-threads; but when (as hereafter to be explained) it is necessary to liberate the warp-threads, the workman, by depressing that end of the lever or levers *u, u,* nearest to him, will, through the intervention of the cord or cords *s, s,* cause the lever or levers *q, q,* to turn upon their centres, raise the weight or weights *v, v,* and also, by means of the rod or rods *p, p,* cause (as the case may be) one or both of the upper parts *n, n**, of the clamp to turn upon their centres *o, o, o,* and thus liberate the warp-threads. Instead of the usual method of taking off the finished work by means of a roller, the patentee employs (for the purpose hereafter mentioned) the following apparatus,—referring more particularly to the detached fig. 4, which is drawn upon an enlarged scale:—The work, as it is woven, is passed over a rod *w,* enclosed within the jaws of a series of clamps or vices *x, x, x,*—the jaws whereof are firmly screwed on to the work, as shewn at fig. 4; the other ends of the clamps or vices are connected to straps *y, y, y,* which pass around a loose strip of wood, shewn at *z,* and are provided with ordinary buckles, so that they may be shortened at pleasure. To the strip of wood *z,* are also affixed other straps 1, 1, 1,—the lower ends thereof being connected to a roller 2. By this arrangement the workman is enabled (when requisite) to draw off that portion only

of the work which is opposite to certain of the straps *y, y, y*; and at other times (by turning the roller 2, through the intervention of the hand-wheel 3,) to wind the straps 1, 1, thereon, and thus draw forward the whole width of the work.

The manner of working this improved mechanism for the production of shapes, suitable for making into the various articles of clothing before mentioned, is thus described with reference to the diagrams shewn at figs. 5, 6, 7, and 8:—Suppose, for instance, it is desired to weave a shape suitable for being made into an over-coat: in order to effect this, it is evident that that side of the machine which shall produce the portion of the shape intended to form the skirts must give off more work than the centre part thereof, so that the required fulness and folds may be obtained; and also that, at that side of the machine which shall produce the portion of the shape intended for the shoulders, more material must be woven.

The workman commences weaving as in the usual mode of such operation, and continues passing his shuttle through the warps, by means of the picker-handle, as in ordinary hand-looms: this he continues until it is necessary to commence making more work, at one or the other side of the loom (suppose in this instance the right); in which case, he may be imagined to have arrived at the part represented by the line A, A*, in diagram fig. 5: he will then commence inserting the weft-thread, by means of a hand-shuttle, gradually nearer to the right-hand side of the loom; taking it out, for example, between the spaces *a, b, c*, &c. (which may be considered to represent those between the warp-threads on a magnified scale), one after the other, towards the right-hand end, and working so many courses of treadles at each of the said spaces as his instructions direct; and continuing thus until he shall have arrived at the point B;—the work, as woven, being in the meantime beaten up by the ordinary means. The required fulness, to form the folds, will now have been obtained,—such fulness being in that portion woven between the points A*, and B. Let it now be considered that it is necessary, for a time, to weave equally in the whole breadth of the shape. In order to continue thus, the workman depresses the lever *u**, placing it under the notch 4, fig. 1; which, by the means before described, will raise the right-hand portion *n**, of the clamp, and render those warp-threads, which were confined by it, free to be drawn from their several bobbins. The reed is then brought forward, so as to carry with it that part of the woven shape between A*, and B; and the clamps or vices *x, x, x*, which are situated opposite to that

part of the work between A*, and B, are then, by means of the straps and buckles *y, y,* drawn towards the workman, until the whole of the work is brought parallel to the reed, as shewn in the diagram, fig. 6. The operator will then allow the clamp *n**, again to fall on to the warp-threads, and will continue his weaving, as desired, across the whole breadth of the work, until it is required to form another portion of extra work or fulness. It is evident, however, that, instead of making work towards the right-hand only, during the operation of weaving from A, to B, the workman may, at intervals, cause the weft-thread to pass throughout the whole width of the warp: for instance, after passing his shuttle through the warp to *a,* he may, by the means before described, bring the work parallel with the reed; then, for a certain number of courses, weave the whole width; and then pass the weft as far as the space *b;* and so on. Suppose also, for the sake of illustration, that it is desired to form a shape, having a fulness on each side, as represented in the diagram, fig. 7,—the workman would weave, as before, up to the line A, A; he would then pass a hand-shuttle in at each side of the warp, gradually narrowing the throw of each weft, as described with reference to the last diagram, so as to form the two full portions A, B, A, D. In the meantime, however, he would work the machine-shuttle at intervals throughout the whole width of the warp (the extra weaving at each side being as often taken up as before described): that is to say, between the points A, B, and A, D, he passes his weft-thread more frequently, and, as a consequence, makes more work than he does in the space between those portions. The shape thus produced would resemble the half of that suitable for making into an over-coat,—the other half being woven by working similar courses backward; and, when laid out flat, would be of similar form to the diagram fig. 8. In order to produce the pleat for the pocket (if such be desired), the workman must throw his weft for the required number of picks from E, to F, only (see fig. 8,), and beat up the work as before;—in like manner producing the centre pleat (if required), as at G, fig. 8.

The goods, thus manufactured, are preferred to be woven with a double set of warp-threads, so as to manufacture two shapes at the same time; for, by this plan, twice the quantity of work is produced with the same amount of labor required for taking up: one of such double shapes may however form a lining to the other, and may be of different materials or color to that intended to form the outward part.

In manufacturing sleeves, to be applied in making up the

coat or other shape of outward garments, the workman proceeds as before described, according to the form required; and, by the use of two sets of warps, as above mentioned, weaves one-half of the shape double; and, in order to unite such halves, the two sets of warps are worked as if they were one set, and a weft-thread is passed through them; by which means the halves are stitched together and become a perfect sleeve. This plan is also adopted for stitching together the linings in coats or other garments, at such places as may be deemed requisite. The patentee remarks, that, in making sleeves, after having formed one such shape, he reverses the sides thereof, so as to bring the wider to that side of the loom at which the narrower side was made: by this plan, a waste of much of the warp is prevented.

From the foregoing description it will be understood that any required shape may be given to the garments intended to be made. It will also be obvious that they may be of cotton, wool, silk, or other suitable material or mixture of materials. By this invention, border patterns may also be introduced into garments, such, for instance, as ladies' mantles,—the said border patterns being woven into the fabric.

The patentee next proceeds to describe (for the workman's instruction) the method he adopts for regulating the shape intended to be produced. The diagram, fig. 9, shews a plan which has been in use as the workman's guide, and is drawn out for the production of an over-coat. This plan is divided vertically by lines, which correspond in number to the divisions of inches marked upon the ordinary temple 5, (see fig. 2,),—the two thicker lines enclose a space within which no fulness or extra work is required; and it is from these two thicker lines, to the right and left, that the workman starts in counting the divisions. The first number written (to the left of the diagram) is four inches; and from that point a line is drawn, extending across the whole of the divisions, corresponding to those on the temple. This signifies that he is to pass his shuttle the entire width, until he has woven four inches in length of the intended shape. The next transverse line commences from his starting point to the right hand, and extends across ten divisions, answering to those on the temple, and has *'s marked thereon, signifying, at the first course of his treadles, he is to weave with a hand-shuttle the whole length of that line; at the next, from the outward end thereof to the first *; after which, as far as the second *, only; and so on to the end of the line. The work thus made is then to be brought forward, so as to bring it parallel with the reed, as before

described. The following line, it will be seen, extends throughout the width: the operator will now therefore make his work accordingly;—the number 13, signifying that he must work the treadles that number of courses throughout the whole width of warp; the next line instructs him to weave with the hand-shuttle gradually from the starting point to the right hand, as before described; and so on,—the throw of the weft-thread being regulated by the *'s upon the transverse lines. Having arrived at the point Z, it will be perceived that the diagram instructs him to put in extra work (that is to say, work produced by the hand-shuttles, and which takes place between the intervals of weaving throughout the width) on both sides: on the right hand, he will weave as far as the transverse line extends,—in this case, however, diminishing the throw of his weft, according to the *'s, one division at a time; and on the left-hand side, decreasing at two divisions at a time, as before. He will thus continue until he has worked according to the direction indicated by the line X; above which, at the right hand, the next operation is to form the pleat for the pocket,—the instructions for this being, that the weaver, starting at the line on the temple corresponding to that on the diagram, shall weave two inches in length, and then beat up his work. On the left-hand side, the diagonal line signifies that he is to weave twenty courses,—diminishing the throw of his weft one space between each such throw in the direction of the said diagonal line. The line Y, represents a central pleat, and is produced in the same manner as the pleat for the pocket. Thus far, one-half of the intended coat is woven; and the workman has merely to follow the same instructions backwards to complete the other half.

When woollen materials are used, the subsequent operations of dressing and finishing are similar to those adopted with reference to woollen cloth of ordinary manufacture. In the steaming process, it will however be found convenient to use, instead of the ordinary cylinder, a chamber of like shape to the garment when folded around it;—in pressing also, the millboards, between which the goods are placed, should be so made as to project into the form of the garment when laid flat. The shapes, when woven and dressed, are fitted with collars, sleeves, buttons, &c., in the usual way, by the tailor or other workman.

The patentee remarks, that various alterations may be made in the arrangement of the machinery without departing from the principle of his invention;—for instance, the clamp *n*, may be constructed in three or more pieces, if required;

and, instead of being held upon the warp-threads by means of weights, the required pressure may be effected through the agency of screws, or other suitable mechanical contrivances. Instead also of the hand-vices and strap, described for holding the work, a similar clamp to that used for the warp-threads may be placed above the breast-beam, and caused to press upon the work when required, by means of levers and weights, or other suitable contrivance,—the shape, as produced in its irregular quantities, being drawn forward by hand. Or, in some instances, the same may be accomplished by placing in the front of the machine a work-beam, of such shape that its periphery shall correspond in form to the shape intended to be produced: that is to say, the said beam shall be of such unequal dimensions that the woven shape, when coiled around it, shall fit thereon. This beam may be turned by hand in any convenient manner, so as to take up the work as it is produced; but, in order that the warp-threads may proceed therefrom, and through the reed, in the proper even direction, the work must be passed over a roller. If this arrangement be adopted, it will also be necessary to wind the warp-threads upon a beam, similar in shape to that of the work-beam, —the threads passing from the various diameters thereof being conveyed under a roller, in order to bring them into the suitable even disposition to the reed. The operation of the machine, under this modification, being similar to that described with reference to the foregoing, no further description will be necessary,—the only difference being, that the work is taken up by turning the beam; and, although not applicable in all cases, may be found to answer the purpose for some shapes.

The patentee claims, Firstly,—the weaving of shapes of any material suitable for being fitted up into coats, waistcoats, trousers, cloaks, and other similar articles of external clothing for men; and also the weaving of other shapes of any material suitable for being fitted up into cloaks, mantles, and other external clothing for women, by the method above described; —the essential character of the invention consisting in so combining the weft with the warp-threads of a loom, for the purposes before mentioned, that more or less work shall be produced at various parts of the width thereof, according to the form required to be manufactured. Secondly,—the general arrangement and combination of machinery and apparatus above described, and particularly the application of the clamp to the warp-threads. And, further,—the method described of conveying instructions to the weaver in the pro-

cess of weaving the articles before mentioned;—the principle of such method being the use of a diagram or plan, having divisions marked thereon corresponding to divisions marked upon the temple of the loom, as before described.—[*Inrolled February,* 1850.]

To Alfred Vincent Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in coupling joints for pipes,—being a communication.*—[Sealed 26th March, 1850.]

This invention of improvements in coupling joints for pipes consists in enveloping the abutting ends of two pipes, with a belt or tube of some soft substance, and forcing over this belt a tube of some harder substance, which will compress the belt of soft substance against the pipes, and thereby form a strong water or air-tight fastening.

In Plate XII., fig. 1, represents, in longitudinal section, the adjacent portions of two pipes, fastened in the manner described; and fig. 2, is another longitudinal section, shewing a modification in the form of the abutting ends of the pipes.

A, A^1, represent the adjoining extremities of two pipes, abutting against each other, and surrounded by a short tube of lead *a, a,* which is kept in position by a ring-shoulder *b,* cast on to one of the pipes A. The leaden tube should have a conical exterior; and the outer surface of the extremities of each pipe should be grooved, as represented in the drawings. B, is an outer tube (made, in this example, of cast-iron), having a conical interior, corresponding with the exterior of the inner or soft tube: it is also provided with a flange *c, c,* which, when the tube is applied to the pipe A, A^1, will abut against the opposite end of the tube *a,* to that which is in contact with the shoulder *b,* of the pipe A. The exterior of the tube or band *a,* should be somewhat larger than the interior of the iron tube B; so that when the latter is forced over the former, it will compress the yielding tube or band into all the indentations on the surface of the pipes; while the yielding material is prevented from being squeezed out by the ring-shoulder *b,* on the pipe, and the corresponding one *c,* on the outer tube.

The outer tube has been described as having a conical interior; but when the belt or inner tube is very soft and plastic, the outer tube may have a cylindrical interior, fitting closely upon the shoulder *b,* while the flange *c,* will fit closely to the

exterior of the pipe; so that, when the outer tube is forced over the belt, the latter will be compressed between the flange *c*, and shoulder *b*, with the requisite force to bring it into close contact with the pipes, and form a tight and firm joint.

The projecting shoulder *b*, on the pipe, may be dispensed with, and the soft belt be prevented from squeezing out at that end of the outer tube, by a temporary stop or gripe, which may be removed from the pipe as soon as the connection is made, and used in like manner for fastening the next joint.

In order to make the joint more perfect, in some cases a flange is cast upon the extremity of each pipe, as shewn at fig. 2; and this flange may, if necessary, be turned smooth before the pipes are laid.

The advantages of this improved coupling-joint for pipes are, First,—its cheapness, which adapts it to all descriptions of pipe. Second,—in lead joints, it not only obviates the loss of time and trouble in running melted lead into the joint, and the after process of caulking, but actually makes a better joint. Third,—the facility with which a damaged pipe can be replaced, or a branch introduced in a line of pipes already laid,—as the iron tube has merely to be forced backward, and the lead or other yielding material removed; when a new pipe or a branch can be quickly coupled to the line of pipes, and the joints rendered as perfect as those first made. And, Fourth,—it affords great facilities for laying pipes under water, as the joints can be easily and quickly made in such situations.

The patentee claims the constructing of coupling-joints, by enveloping the abutting ends of pipes in a belt or tube of lead, or other suitable yielding substance, so as to cover the seam or junction, and then forcing over this belt or tube a tube of some harder or unyielding substance, whereby the yielding substance will be compressed between the pipes and the outer tube, and a secure joint will be obtained.—[*Inrolled September,* 1850.]

To Thomas Dickason Rotch, *of Drumlamford House, in the county of Ayr, North Britain, Esq., for improvements in separating various matters usually found combined in certain saccharine, saline, and ligneous substances,—being a communication.*—[Sealed 26th March, 1850.]

The first part of this invention relates to the centrifugal machines now used for refining or purifying sugar, and is

designed to counteract the tendency of the drum of such machines to oscillate when in rapid motion. For this purpose, the lower end of the drum-shaft is caused to work in an adjustable socket, from which a heavy weight is suspended. In Plate XI., fig. 1, exhibits a vertical section of the apparatus. *a*, is the drum; *b*, is its shaft; *c*, is the socket that receives the lower end of the shaft; and *d*, is the weight suspended therefrom. *e*, is the case, wherein the drum revolves, in the bottom of which a circular hole is formed, to receive the socket *c*; and this socket is made with a bell-mouthed or hemispherical top or flange, which serves to support the socket in such manner that it can adjust itself according to the motion of the shaft, in order to prevent oscillation.

The second improvement consists in effectually preventing the oscillation of the drum-shaft of such centrifugal machines, by causing the lower part of such shaft to work in fixed bearings, and the bottom thereof to bear upon several conical friction-rollers, as shewn at figs. 2, and 3,—fig. 2, being a vertical section of the bearings, and fig. 3, a plan view of the set of friction-rollers. *a*, is the shaft; *b*, the fixed bearing; and *c*, *c*, are the conical friction-rollers.

The object of the third part of this invention is to render the employment of centrifugal machines more advantageous than heretofore in separating crystals of sugar from molasses and other liquid impurities, by making the crystals, which are to be subjected to the action of the machine, of a larger size than usual. This is effected by running the syrup direct from the vacuum-pan into large shallow coolers, each capable of containing from two thousand to three thousand quarts;—the temperature being from 120° to 125° Fahr., and the density from 30° to 35° Beaumé.

The fourth part of the invention consists in an improvement in the process of decolorizing or (as it is termed by sugar-refiners) giving "color" to the sugar, when in moulds, by the employment of woollen, linen, or cotton fabrics, and sponge or spongy material. In carrying out this improvement, a piece of cloth is laid upon the large end of the loaf of sugar, and upon the cloth a piece of sponge, about two inches thick, is placed. After the sugar has been twice liquored, as much filtered water is applied to the sponge, by means of a watering-pot, as it will absorb; and the sponge is repeatedly supplied with filtered water, in gradually decreasing quantities, until the expiration of two days: the sugar will then be perfectly refined and whitened. The solution employed for liquoring is composed of syrup and water, in the proportion

of two quarts of syrup, of the density of 34° Beaumé, and half that quantity of water for every twenty pounds of sugar that is to be operated upon.

The fifth improvement consists in the use of centrifugal machines for separating liquids from saline substances. The salt or saline substance is put into the drum of the machine in a damp state, or moistened with water; and then the drum being caused to rotate, the water or other liquid will be expelled, and the saline substance will remain adhering to the inner surface of the drum. If it be desired to obtain the salt or saline substance in blocks of a particular shape, it should be placed in perforated moulds, and introduced in these into the drum of the machine.

The last part of the invention is stated to consist in the application of the centrifugal process to the separation of coloring matter, &c., from ligneous substances, such as dyewoods; but no further explanation is given.

The patentee claims, First,—the application of the hanging-weight *d*, suspended from the socket *c*, with its hemispherical flange or other contrivance for obtaining motion, like the motion of a universal joint, to centrifugal machines, for separating various matters usually found combined in certain saccharine, saline, and ligneous substances, and for the purpose of preventing or counteracting the oscillation of the drum on its axis when in rapid motion. Secondly,—the application of the friction-rollers and bearings, hereinbefore described, to the vertical axis of such centrifugal machines as aforesaid. Thirdly,—the introduction of syrups from large coolers, and therefore containing large crystals, and of the densities and temperatures hereinbefore described, into the centrifugal machine; whereby a much more perfect and valuable effect is produced by the said machine than heretofore. Fourthly,—the application of woven fabrics and sponge, or other suitable spongy material, as above described, for the purpose of refining sugar. Fifthly,—the application of centrifugal machines to the treatment of saline matters, as hereinbefore described.—[*Inrolled September*, 1850.]

To Alfred Wilson, *of Myddleton-street, Clerkenwell, clock-case maker, for an improved ventilator.*—[Sealed 23rd March, 1850.]

This invention refers to that kind of ventilator in which louvers or luffer-boards, made of glass, metal, wood, or other

suitable substance, are used; and the improvement consists in mounting each louver upon a lever, the fulcrum of which is between the louver and the end whereat the power is applied to open the ventilator; so that the louvers will open out of or away from the frame in which they are mounted.

In Plate XII., fig. 1, is a vertical section of part of a window, provided with the improved ventilator, which is exhibited in an open state; and fig. 2, is a similar section, in which the ventilator is shewn closed. The ends of the louvers *a*, are inserted into recesses or sockets, formed for that purpose in the levers *b*. These levers turn upon pins *c*, fixed in the sides of the metal frame *d*, which fits into one of the compartments of the window-frame, and is attached to the sash-bars thereof. The levers at one side of the frame *d*, are extended a short distance beyond their fulcrum-pins, and are connected by pins with a vertical bar *e*, in order that the movements of the louvers, in opening and closing, may be simultaneous: the levers at the other ends of the louvers are made as shewn at fig. 3, and serve simply as the means of supporting those ends. From the lower part of the bar *e*, is suspended a rod *f*, which passes through a hole in the sash-bar and through the staple *g*, and is formed with a hook or catch at its lower end, to take into the teeth of the rack-piece *h*.

The ventilator is opened by taking hold of the handle or loop f^1, of the rod *f*, and thereby pulling the bar *e*, downwards; when, in consequence of the extremities of the levers *b*, being connected to that bar, the levers will turn upon their fulcrum-pins, and the louvers will assume similar positions to those represented at fig. 1. The ventilator is kept open by inserting the catch of the rod *f*, into the teeth of the rack-piece *h*; and, in order to close the same, it will, in general, only be necessary to release the catch, when the weight of the louvers will cause them to descend into the positions shewn at fig. 2; but, if this is found to be insufficient, the ventilator may be closed by taking hold of the knob e^1, on the bar *e*, and thereby raising that rod and depressing the louvers. In place of pulling down the bar *e*, by means of the rod *f*, the same effect may be produced by lengthening the upper lever *b*, (as indicated by the dotted lines b^1, fig. 1,) and attaching a cord thereto.—[*Inrolled September*, 1850.]

To GEORGE HOLWORTHY PALMER, *of Westbourne Villas, Harrow-road, in the county of Middlesex, civil engineer, and* JOSHUA HORTON, *of the Ætna Steam-engine, Boiler, and Gasometer Manufactory, Smethwick, near Birmingham, in the county of Stafford, for improvements in the arrangement and construction of gas-holders.*—[Sealed 21st February, 1850.]

THIS invention of improvements in the arrangement and construction of gas-holders relates to a more simple, efficient, and economic mode of supporting the top of the gas-holder than by the costly and ponderous trussing, staying, and bracing, heretofore adopted for that purpose.

In Plate XII., fig. 1, is a horizontal representation of the top of a gas-holder, shewing the general construction of its framing, and the arrangement of the covering-plates. Fig. 2, is a vertical representation of part of fig. 1, upon an enlarged scale, shewing a portion of the segmental angle-iron, or T-curbs, or hoops, equilibrium blocks, and a portion of the outer plates, to which the said curbs and blocks are bolted. This arrangement offers sufficient strength to resist the central tug or concentrated pressure to which it is subject when the gas-holder is afloat. Fig. 3, is an elevation of a gas-holder,—say 100 feet in diameter, and 25 feet deep;—part is shewn in section from A, to B, of fig. 1, and part in elevation. Fig. 4, is a transverse section of fig. 2, taken from C, to D, shewing the angle-irons, equilibrium blocks, and the plates to which they are bolted. Fig. 5, is a section of an hydraulic sealed cup, which may be attached to the centre plate of the gas-holder, and is intended to carry off the rain which might accumulate upon the top of the gas-holder when out of use. *a, a,* fig. 1, are the crown-plates, to the centre of which, at *d,* would be affixed the sealed cup shewn at fig. 5, but not shewn in this first figure. *b, b, b,* are four radial plates, connecting the crown-plates with the external plates or outer rim *c, c, c.* All these plates are of No. 4 gauge,—the remaining filling-in plates being of No. 12 gauge. *e, e,* fig. 2, is a portion of the combined segments forming the angle-iron curbs or hoops; *f, f,* are the equilibrium blocks, which, by preference, are made of teak wood; and *c, c,* are the external covering-plates. The segments forming the curbs or hoops butt end to end, and are secured by short plates *k, k,* set to the proper curve, and lapping over each segment, to which they are secured by rivets. The inner curb or hoop is formed of double four-inch stout angle-iron, bent to the proper curve, and secured back to

back with rivets, or bolts and nuts,—the joints being "broken" to ensure additional strength. These curbs are set flat, and fitted and secured to the plates *c, c,* by bolts and nuts. The external curb *e, e,* (see fig. 4,) is a single curb, and the same as has been hitherto adopted; but the segments are rolled stouter than usual. As these curbs will have to overcome the central tug or concentrated pressure upwards of the gas-holder top (which is equal to its floating gravitating power), the equilibrium radial teak-blocks *f, f,* are introduced between the external and internal hoops, and firmly bolted to the plates *c, c,* as shewn at figs. 2, and 4. By this peculiar arrangement, the tug upon the external curb is communicated to the internal hoops, the united strength of which, assisted by the stout covering-plates *c, c,* (if kept free from buckles, which is most effectually ensured by the blocks *f, f,*) is found to offer far greater advantages than could be obtained under the old system of roofing. The patentees prefer the radial distribution of the blocks; but other arrangements of wood or metal might be made, or the intermediate space might be filled in altogether.

Although the gas-holder top is not built of a segmental form, as trussed gas-holders have hitherto been, the roof, when the gas-holder is afloat, must take the form shewn by the dotted line at fig. 3. Now, as there is no trussing to support the top, which is built perfectly flat, it would, by its own weight, when the gas-holder is not occupied with gas, necessarily deflect below the level of the curbs *e, e;* and would, in that event, form a basin, in which the accumulation of rain would be attended with serious consequences, were not some suitable means of prevention adopted. This can be done, either by the use of the sealed self-acting hydraulic cup, fig. 5, or by the erection of a permanent framing of wood or other material within the gas-holder tank, and raised to such a height as to support the roof, and allow of the passing off of the rain, when the gas-holder has its bearing upon the tank-bottom, and the gas or air within is in equilibrium with the pressure of the atmosphere without. The adoption of framing is much to be preferred, as it forms the stage for the operations of the workman during the construction of the gas-holder, and is exceedingly economic in its cost: this would supersede the use of the hydraulic cup.

The whole weight of the gas-holder top, of the horizontal angle iron framing *m, m,* and of the vertical T-iron ribs *n, n,* is thrown upon the bottom angle-iron and base-plate *s, s,* as shewn in the sectional part of fig. 3, which also support the gravity curb *h, h,* instead of bearing upon the side plates. This

results from the principle of keeping the horizontal angle-iron framing and vertical T-irons totally unconnected with the gas-holder side;—thus converting the crushing gravity of the aforesaid parts into a hanging weight or tug, of which each rivet takes its due proportion. To relieve the tug upon the side plates (of No. 10 gauge), the vertical plates *v, v, v,* (of No. 4 gauge) are connected with the band-plates *p, p,* (see fig. 3,) also of the same gauge. One of these plates *v, v,* is immediately opposite to each of the radial plates *b, b,* fig. 1, the remainder being equally spaced. Their number must depend upon the number of guide-pulleys required; the carriages for which are affixed to these plates in the usual manner. In a gas-holder of 100 feet diameter, 24 pulleys are required,—12 fixed at the top and 12 at the bottom of the plates *v, v.* In one of 135 feet diameter, the number required is 32, disposed in like manner.

At fig. 4, the angle-iron curbs *e, e,* the equilibrium blocks *f, f,* and part of the covering-plates *c, c,* are shewn in section, as is also the method of securing and bolting the same.

Fig. 5, is a section of the hydraulic cup, which might be affixed to the centre-plate *d,* of the gas-holder top. The rain-water desired to be removed will escape through the openings in the bottom of the cup,—the water in the hydraulic valve rising sufficiently high to prevent the escape of gas at the pressure required.

The patentees claim, Firstly,—the application of the inner curbs or angle-irons forming the double hoop (see A, fig. 4,), the use of the equilibrium blocks *f,* shewn in the same figure, and any similar series of curbs or blocks that may be required for gas-holders of greater diameter and weight. Secondly,—the mode whereby the whole weight of the gas-holder (that of the side plates alone excepted) is thrown upon the bottom angle-iron curb *s, s, s,* (see fig. 3,);—the whole of the downward thrust being converted into a right line tug upon the side plates of the gas-holder, by not rivetting the side plates to any parts of the vertical ribs *n, n,* or angle-iron curbs *m, m, m.* And, Lastly,—the general arrangements of the gas-holder combined as a whole, but not each individual component part considered separately; as these have, with the exception of the above claims (which are new in principle and application), been heretofore adopted under variously modified forms.—[*Inrolled August,* 1850.]

To Joseph Pierre Gillard, *of Paris, in the Republic of France, Gent., for certain improvements in the production of heat and light in general.*—[Sealed 22nd November, 1849.]

This invention consists in certain improvements in obtaining hydrogen gas by the decomposition of water, and in applying the same to the production of heat and light.

Three different methods of obtaining hydrogen gas are described in the specification:—the first consisting in the employment, for that purpose, of iron in a state of incandescence; the second, in the use of carbon; and the third, in the employment of magnets for effecting the decomposition of the water. The apparatus for decomposing water (or, more correctly, steam), by means of incandescent iron, is represented, in vertical section, at fig. 1, Plate X. A, is a retort, containing a series of iron tubes *a*, ("which are externally oxidized and internally unoxidized or filled up with pulverized coal to form voltaic elements"); these tubes are retained in their places by the ends thereof passing through the two iron plates *b*, b^1, which close the body of the retort perfectly tight; and the ends of the tubes project into spaces at the ends of the retort, enclosed by the cap-pieces *c*, c^1. *d*, is a fire-place, the flame and products of combustion from which pass along the flue *f*, and heat the retort; *e*, is a pipe by which steam is introduced into the retort; and *g*, is a pipe for conducting the hydrogen gas therefrom into a "refrigerent." *h*, is a pipe, by which oxide of carbon [carbonic oxide] is introduced into the tubes *a*, for the purpose of deoxidizing them; and *i*, is a pipe, through which the carbonic acid, produced by the deoxidation of the iron tubes, is discharged. In place of the tubes *a*, the retort may contain iron chains, iron wire, or spirals of iron, in an incandescent state. Steam being introduced into the retort through the pipe *e*, is decomposed by the incandescent iron: the oxygen combines with the iron, and the hydrogen passes off through the pipe *g*, and is collected for use. Instead of steam, water may be admitted into the retort through the pipe *e*.

When the iron is oxidized, it may be deoxidized in three different ways, which the patentee describes. The first method consists in deoxidizing it by means of the waste gas of furnaces, by changing the carbonic acid of such furnaces into oxide of carbon in a suitable furnace or kiln, and conducting such oxide of carbon into the retort containing the oxidized and incandescent iron, from which it will take a portion of

oxygen and pass off, through a pipe at the opposite end of the retort, in the state of carbonic acid. If the iron be in the form of tubes, fitted in the manner shewn at fig. 1, the operation of decomposing the steam, and consequently oxidizing the exterior of the tubes, may proceed at the same time that the deoxidation of the interior of the tubes, by means of oxide of carbon, is taking place; but it is preferred to shut off the supply of steam during the deoxidizing process. Secondly, the iron may be deoxidized by letting fall upon it, when it is in an incandescent state, pulverized coal, charcoal, coke, ligneous substances, &c.; or by subjecting it to the action of hydrogen and oxide of carbon [obtained from any other source than the waste gas of furnaces]; or by pouring oil or any of the hydro-carburets, even tar or ammoniacal waters, upon it. The third method of deoxidizing the iron consists in subjecting it to a white heat, whereby it will be deprived of its oxygen, like peroxide of manganese, and return to the state of protoxide of iron.

The second part of the improvements in the manufacture of hydrogen gas consist in decomposing water (or steam) by means of incandescent coal, charcoal, coke, ligneous substances, or "carbonized pit." The first arrangement of apparatus, described for this purpose, is similar to that commonly used for manufacturing carburetted hydrogen gas from coal, with the addition of a small boiler for generating steam. The retorts (which are horizontal) are charged with coal, and heated in the ordinary manner; and steam is introduced into each retort from the boiler, and distributed over the surface of the coal, by means of a pipe, which is perforated with numerous small holes, similar to the spout of a watering-pot. The steam is decomposed by the incandescent fuel; and hydrogen, carbonic acid, and a small quantity of oxide of carbon and other gases are produced. These gases are conducted from the retort into a purifier (or, as the patentee terms it, an "epurator"), where the carbonic acid is taken up; and from thence the hydrogen passes into a gasometer. The principal feature of novelty in this process is the distribution of steam over the surface of the coal, instead of passing it through the same.

Fig. 2, exhibits a sectional view of an arrangement of apparatus for decomposing steam by incandescent coal, or similar substance, in a vertical retort. *a*, is the retort; and *b*, is a vessel containing pulverized coal, which is discharged therefrom, by means of a screw-feeder *c*, on to a wire sieve *d*, fixed across the upper part of the retort. Steam is admitted, through the

pipe *e*, into the lower part of the retort, and, ascending within the same, comes in contact with the incandescent coal, and is decomposed thereby. The gases pass from the retort, through the pipe *f*, into the purifier *g*; and from thence the hydrogen is conducted, by the pipe *h*, into the gasometer *i*, where it is stored for use.

A modification of this apparatus is described;—the principal point of difference being in the employment of a purifier, which is apparently designed to serve also as a gasometer; but this is not clearly pointed out in the specification.

The apparatus for effecting the decomposition of water by means of magnets is represented at fig. 3. The description thereof, in the words of the patentee, is as follows:—" A, A, A, A, represent the bobbins of induction; B, is the axis, giving motion to the bobbins A, A, A, A; C, is the conduct-pipe for the oxygen; D, the conduct-pipe for the hydrogen gas; O, the pipe in which the oxygen is produced; H, the pipe where the hydrogen is generated; M, the gasometer for the oxygen; G, the gasometer for the hydrogen; K, K, large troughs of water, which can be either heated or acidulated. I decompose water by using magnets, working with the induct-bobbins A. I set all the movements of each magnet *a, a, a, a,* on an axis B, which set in motion all the bobbins A; and as there is only one resistance of attractive action, which is resisted by that of the opposite pole, it follows that with a very small force I put in action a considerable number of magnets, by means of cogs and transmission of mechanical movements: the magnets decompose the water, and give out pure hydrogen at one pole, and at the other oxygen gas, equally pure. These gases are both received in separate and purposely prepared gasometers. The water set in vacuum, or containing a certain portion of acids, or heated to a certain temperature, or even steam-water, is more rapidly decomposed; and to carry out more easily the above operation, it is well to operate within the hereinbefore-stated limits."

The object of the next part of the invention is to obtain a brilliant light by the combustion of hydrogen. The method consists in causing a small jet of lighted hydrogen, from a burner made with small holes, to act upon a thin strip of platinum, or a wick of platinum-web, formed with fine threads or wires of a graduated section, proportioned to the intensity and shape of the flame: the platinum becomes heated to such a degree of whiteness that an extremely brilliant light is produced. Fig. 4, is a diagram, illustrating the mode of carrying out this improvement. *a*, is the platinum-wick; *b, b,* are

bearers of platinum, for supporting the same above the burner *c*; and *d, d,* are threads of platinum, which serve to support and retain the wick in its proper position over the burner. Instead of platinum, other unalterable and unoxidizable metals may be used. The wick may be of a conical or other shape, corresponding to that of the jet of hydrogen; and it is to be made more or less strong, according to the intensity of the heat to which it will be subjected.

Another part of the invention consists in utilizing the gas commonly lost from the mouths of melting furnaces, and in accelerating the melting of the ore by the combustion of hydrogen, oxide of carbon, and air, mixed together. The hydrogen is produced either in retorts, as before stated, or in a furnace, from twelve to fifteen feet high, made like a kiln, and filled with coke, pit-coal, charcoal, or ligneous substances; in which furnace a powerful draft is maintained, and steam is at the same time injected into it; and the hydrogen and oxide of carbon, which are produced together, are drawn out by means of a strong mechanical draft. The melted ore in the furnace is more or less carburetted by the powdered coal thrown upon it; and this process is employed in puddling furnaces, in which carburation is easily effected by cementation, as well for pig-iron as for steel. The same process is equally applicable to reverberatory furnaces, and also for heating the boilers of locomotive engines. For the latter purpose, hydrogen and oxide of carbon, together with hot or cold air, are injected under the boiler by means of concentric tubes; and they are also injected by like means into the tubes of tubular boilers.

The last part of the invention consists in constructing gas-burners in such manner that there will be two currents of air, one acting externally and the other internally of the flame;—the object being to supply a large quantity of air to support combustion: the patentee does not give a drawing or any further description of the construction of these burners.

The patentee claims, First,—the production of hydrogen gas by decomposing water in furnaces and retorts serving to distil coal, as hereinbefore described. Secondly,—the process for producing hydrogen and a small quantity of oxide of carbon, as hereinbefore described. Thirdly,—the illuminating by means of the electricity of magnets, put in motion by any mechanical power, as hereinbefore described. Fourthly,—the process for producing hydrogen and oxygen by means of magnets, put in motion simultaneously by any force whatever,—the two gases being separately collected, as hereinbefore described. Fifthly,—the means of rendering platinum and other

unalterable and non-oxidizable metals illuminating by the combustion of hydrogen, or even of oxygen, as hereinbefore described. Sixthly,—the process of rendering platinum or other non-oxidizable metals more or less illuminating by means of hydrogen, or of hydrogen and oxygen, or also of hydrogen and air, united before or at the place of combustion, as hereinbefore described. Seventhly,—the process of illuminating by heating platinum and other non-oxidizable metals to luminous white heat by means of oxygen, burnt either alone or combined with hydrogen, as hereinbefore described.—[*Inrolled May,* 1850.]

To Charles Seely, *of Heighington, in the county of Lincoln, merchant, for improvements in grinding wheat and other grain.*—[Sealed 5th April, 1850.]

This invention consists in certain improvements in the mode of introducing air between mill-stones, for the purpose of keeping the same cool during the operation of grinding grain.

In Plate XII., fig. 1, is a vertical section and fig. 2, a sectional plan view of the apparatus for introducing air between the mill-stones. *a, a,* are horns or curved hollow channels for collecting air; their inner ends are connected with the cylinder *b,* fixed in the eye of the runner or upper stone *c*; and the air, as collected by the horns *a, a,* descends between the cylinder *b,* and the inner cylinder *d,* (provided for the passage of the grain), and escapes between the mill-stones. *e, e,* are blades or fans, affixed to the outer ends of the horns *a, a,* in order to aid in collecting the air; and *f,* is an annular case or chamber, within which the horns work.

The patentee says he is aware that horns, similar to those above shewn and described, have before been applied to mill-stones, for the purpose of introducing streams of air. He does not, therefore, claim the same. But what he claims is, First,—the application of the fans or blades *e,* in combination with horns employed for introducing air between mill-stones. Secondly,—the application of a case *f,* in combination with the use of horns employed for introducing air between mill-stones. Thirdly,—the causing of the horns used for collecting air for mill-stones to be connected with a chamber in the eye of the mill-stone, as shewn and described.—[*Inrolled October,* 1850.]

To Joseph Theodore Clenchard, *of Paris, in the Republic of France, manufacturing chemist, for certain improvements in the application of archil to the processes of dyeing and printing in colors; and also an improved apparatus to be employed in the operation of dyeing.*—[Sealed 26th March, 1850.]

The first part of this invention consists in the application of the archil lichen or weed, in its natural or unprepared state, in combination with alkalies and lime, to the direct dyeing of wool and silk, and fabrics made of wool and silk. The following is the mode of conducting the operation:—From 40 to 50 gallons of water are mixed with from 40 to 50 lbs. of slaked lime, and the mixture is allowed to settle. The clear liquor is drawn off, mixed with from 5 to 7 lbs. of soda-ash, and put into a copper or other suitable vessel, together with from 180 to 220 lbs. of archil lichen or weed, which has been previously ground; and the whole is boiled, by means of steam or otherwise, for one hour or more (according to the depth of color required), and either with or without the material or fabric to be dyed. If the material or fabric is not boiled with the archil and other matters, it must be boiled in the dye-bath (after the desired quantity of coloring matter has been extracted from the archil) until it has become sufficiently impregnated therewith. When the material or fabric is removed from the dye-bath, it is washed with a portion of the dye-liquor, and dried. It is then put into a close vessel of wood, or other suitable material, with some of the dye-liquor, and as much caustic ammonia as will be sufficient to produce the desired shade of color: the quantity of caustic ammonia used should in general be equal to about 20 per cent. of the archil employed in the preparation of the dye-bath. The temperature of the apartment in which the dyeing is carried on should be maintained at from 110° to 112° Fahr.

The second improvement consists in the application of the archil lichen or weed, in its natural or unprepared state, in combination with alkalies, and with or without lime, to the printing of woollen fabrics. The dye-liquor, prepared in the manner above described, is reduced, by evaporation, to a suitable consistence to be employed in the printing of woollen fabrics; and after the fabrics have been printed therewith, the color is brought out by means of ammonia. In cases where lime would act injuriously on certain colors, it is to be omitted in the preparation of the extract of archil.

The third part of the invention consists in an apparatus to

be employed in the operation of dyeing upon a large scale. In Plate XII., fig. 1, is a longitudinal section of the apparatus; fig. 2, is a transverse section, taken at the centre thereof; fig. 3, exhibits the right-hand end of the apparatus; and fig. 4, represents the left-hand end of the same. It consists of a case *a,* through which a hollow shaft *b,* extends, carrying the framework *c, c,* on which the pieces of fabric *d, d,* intended to be dyed, are secured. The shaft *b,* is pierced with numerous small holes throughout the greater part of its length; upon one end of it is fixed a cog-wheel *e,* which receives motion from a pinion *f,* turned by a winch-handle; and into this end of the shaft the extremity of a pipe *g,* is inserted, for the purpose of introducing dye-liquor into the shaft. The pipe *g,* is connected with a pump *h,* which draws the dye-liquor from a reservoir *i,* and is worked by a rod *j,* from a crank-pin upon the pinion *f.* There is an opening in the top of the case *a,* at the middle of its length, in which a double flap or cover *k,* is suspended on pivots; and this cover is caused to vibrate on its pivots, and admit air into the case *a,* by a tappet b^1, on the shaft *b,* striking against the rod *l,* which is fixed to the cover, and extends upwards through the same,—carrying, at its upper end, a counterbalance weight l^1. In the sides of the case *a,* there are doors a^1, for introducing and removing the fabrics. *m,* is a pipe, through which steam or heated air is caused to circulate, for the purpose of heating the interior of the case *a;* and *n,* is a trough, to receive the surplus dye-liquor and return it into the tank *i,* through the pipe *o,* (fig. 3).

The operation of dyeing by means of this apparatus is as follows:—The fabrics having been fixed upon the framework *c, c,* the shaft *b,* is caused to rotate, by applying manual power to the handle of the pinion *f;* and the rotation of this pinion also causes the pump *h,* to force the dye-liquor through the pipe *g,* into the shaft *b.* The dye-liquor passes through the perforations in the shaft *b,* and falls in the form of a shower upon the fabrics, which are carried beneath it by the rotation of the shaft *b;*—part of the dye-liquor is absorbed by the fabrics, and the remainder falls therefrom into the trough *n,* which also receives the surplus dye-liquor that issues from the open end of the shaft *b;* and from the trough *n,* the dye-liquor is returned to the tank *i,* to be again pumped into the shaft *b.*

The patentee claims, First,—the application of archil lichen or weed, in its natural or unprepared state, in combination with alkalies and lime, to the direct dyeing of wool and silk, and woollen and silken fabrics. Secondly,—the application

of archil lichen or weed, in its natural or unprepared state, in combination with alkalies, and with or without lime, to the printing of woollen fabrics. Thirdly,—the combination of parts forming an apparatus for dyeing, as above described.—[*Inrolled September*, 1850.]

To WILLIAM EDWARD NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for an invention of improvements in machinery for dressing, shaping, cutting, and drilling or boring rocks or stone; parts of which improvements are, with certain modifications, applicable to machinery or apparatus for driving piles,—being a communication.*—[Sealed 6th November, 1849.]

THIS invention relates, first, to improved machinery or apparatus for facing, dressing, cutting, or shaping stone; and, secondly, to a novel or improved arrangement of mechanism for drilling or boring rocks or stone. The second part of the invention is, with certain modifications, also applicable to pile-driving.

The machinery or apparatus, which constitutes the first part of the above-mentioned improvements, is shewn in Plate XI., at figs. 1, 2, 3, 4, 5, and 6. The principle of this part of the invention consists in dressing, facing, cutting, shaping, or reducing stone and other substances, particularly such as are of a frangible nature, by the use of a rolling edge or edges, made to act against the surface of the substance under operation; whereby a continuous action on the surface of the material is kept up, and a small portion thereof is, at every motion, detached or cut away, until the required surface is obtained. The cutter or instrument employed for this purpose is a ring or rings of steel *a*, (see figs. 1, and 2). This ring is mounted on an arbor or axle *c*, and is firmly held between a shoulder and a screw-nut *b*. The ring or rings may be made either with plain edges, as shewn in the drawing, or with serrated edges, according to the nature of the material to be acted upon. The cutters thus made are mounted in suitable framework (hereafter described); and this framework is to be propelled over the material to be operated upon, to bring the cutters to act on the surface of the material.

Fig. 3, is a longitudinal vertical section of the machine, shewing the cutters in their place, and at work; fig. 4, is a transverse vertical section of the same; and fig. 5, is a per-

spective view of the cutter-stock, detached from the machine, and shewing the manner of mounting the cutters.

In order to erect this machine, a proper foundation must be constructed, as at A. Upon this a railway, of suitable width and length, is laid, as shewn at B; and on this railway a truck C, is placed, for the purpose of carrying the stone or other material to be operated upon. On the under side of the cross-framing of the truck there is a rack *d*, into which gears a pinion *e*, mounted on a shaft connected with the main driving power: by giving motion, therefore, to this shaft and pinion, the truck may be slowly moved along the railway, whereby the stone will be brought under the operation of the cutters. Over the rails is next erected a substantial framing for supporting the cutting apparatus. The cutters are, as before mentioned, made of circular plates of steel *a*, *a*; and through the centre of each circular plate a hole is made, in order to mount them on a shaft or spindle, which turns in suitable bearings. The edges of these cutters may be ground sharp, with an equal bevil on each side; or for some purposes, they may, as before mentioned, have saw-teeth cut in them. Several cutters, thus formed, may, if required, be put upon one spindle or axle, as shewn at *f*, fig. 4;—washers being inserted between the cutters, to keep them at a proper distance apart. Several cutters are not always required, as a single one will perform in a satisfactory manner; but an additional number will be found to greatly expedite the work. A thread, to form a screw, is cut on the spindle, inside of its journals; and two nuts *i*, *i*, then serve to pinch up the cutters and washers firmly together. The spindle, with its cutters, is mounted in the stock or carrier, which consists of a hollow semi-cylindrical piece *g*, shewn detached, and in perspective, at fig. 5. At each end of the cutter-stock there is a projecting pin or axle *k*, by which it is mounted in a frame, consisting of a double cross-head *m*. In this cross-head the cutters may be set to any angle, by turning the stock *g*, on its pins or axles *k*. To hold the stock securely, and retain it in any given position, there is a bolt *n*, *n*, on each side, inserted in the cross-heads. One end of each bolt is screwed, and works in holes tapped to receive it, as shewn. The other ends are squared (as seen best in the perspective view), and have a flange or shoulder, which presses on the outside of the opposite cross-head: the position of this latter cross-head is shewn in fig. 5, by dots only, in order that the other parts may be more clearly seen. It will now be understood, that by applying a wrench to the squared end of the rods *n*, *n*, the

cross-heads *m, m,* will be drawn up together and made to press hard against the ends of the cutter-stock, and thus firmly hold it in its place. The cutters, thus secured in a suitable frame, are next mounted on the guide-rails or bars *o, o,* which are secured to the moveable frame *p, p*. This frame consists of strong yokes, so arranged that they can be moved up or down on the slotted posts of the frame,—to which, however, they are firmly held or secured by bolts, at any required altitude, when the machine is in operation. By moving these yokes up or down, the guide-rails *o, o,* and the cross-heads with the cutters attached, may be raised or lowered and fixed at any required level. Vertical motion of the moveable frame *p, p,* and the other parts connected therewith, may be effected by mechanical means, such as a rack and pinion or vertical screws, as at *r, r*. The cross-heads are, as above mentioned, supported by and work upon the guide-bars or rods *o, o*;—suitable grooves being made on each side, or friction-rollers provided for the purpose, as shewn in the drawing. The cutter-frame is propelled back and forth by means of any suitable connection with the driving power. In the drawing the reciprocating motion of the cutters and their frame is shewn as being effected by means of a connecting-rod and crank,—that being one of the most convenient modes of effecting the required object.

The operation of the machine is as follows:—Having placed the stone to be cut upon the truck c, and properly secured it in its place by clamps, the cutter-stock should be turned on its pins *k, k,* so that the cutters, when made to advance across the face of the stone, may assume an angular position, as shewn at fig. 4. All the parts being put in motion, the cutters and their frame will be propelled rapidly back and forth on the guide-bars *o, o*; while, at the same time, the truck will be made to advance slowly with the stone. As the first end of the stone approaches the cutters, the vertical frame *p,* must be adjusted by means of the screws *r, r,* so that the cutters may take a proper hold on the stone. By giving the cutters the angular position shewn, they will cut in different planes; each taking a deeper cut than the one preceding it, as is clearly shewn in the drawing. The action of the cutters is produced by rolling over the stone under pressure. When the stone has passed completely through the machine, the cutter-stock is to be turned, so as to give the cutters the requisite angular position in the reverse direction. The motion of the pinion *e,* also being reversed, a second cut may be taken from the face of the stone, if re-

quired; or another side of it, or a new stone, may be presented to be operated upon; or the truck c, being stopped, the cutters may, if required, be made to pass vertically down the end of the stone, by working the screws *r, r,* before described; or this may be performed by a separate machine, peculiarly adapted to this purpose, which would, perhaps, be the most convenient plan. In the arrangement above described, it will be seen that the cutters are so contrived as to be brought down upon the stone, and also made to move over its surface; but the arrangement may be so far changed or modified, that the stone shall be caused to move back and forth under the cutters, while the latter remain stationary,—except that they will have a rotary motion on their axle. The speed with which the stone should move under the cutters must vary with different qualities of the material to be dressed or operated upon; and this may be regulated by changing the speed of the pinion *e,*—which can be accomplished by the use of cone-pulleys, or of different sized gear-wheels, as may be preferred.

Fig. 6, shews, in edge view, another mode of mounting the cutters. In this instance, one or more of the cutters *a, a,* are mounted in a circular stock, and caused to rotate with the stock, by giving rotation to the shaft which carries the stock. *b,* represents the stock; *a, a,* the cutters; *c,* the shaft on which the stock is mounted; and *d,* is a pulley, to which motive power is applied for driving the same.

It will be obvious, from the foregoing description, that this part of the invention is equally applicable to the dressing, facing, and reducing of stone and other materials into circular, curved, or irregular figures, as well as to a flat surface, as above described,—it being only necessary to give to the frame, which carries the cutting or dressing-roller, a feeding motion in the plane of the figure to be produced, or to impart such motion to the material to be operated upon. Or the required figure may be produced by a compound motion of the cutter-frame and material to be worked; as for instance:—To produce a cylinder or column, the material to be worked can be hung in a lathe, and a rotary motion communicated to it, whilst the cutting or dressing-tool is mounted in a sliding rest, which has a slow progressive motion from end to end; and, for producing varying diameters, an additional motion can be given to the rest towards the axis of the lathe-mandril; or, instead of this, the lathe-mandril can, in addition to its rotary motion, have a motion towards and from the rest.

The second part of the invention relates, as before stated,

to improvements in machinery for boring or drilling rocks and stone, preparatory to blasting, or for other purposes; and this machine, with certain modifications, is also applicable to driving piles.

Fig. 7, is a sectional side elevation of the machine, shewing the internal construction or arrangement of such parts of the machinery as constitute the present improvements; and fig. 8, is a sectional plan view of the machine. Fig. 10, represents a sectional elevation of a modification of the machine, shewing a different arrangement of parts for raising the cutting or boring tool; fig. 11, is a sectional plan view and fig. 12, a front view of the same: the remaining figures are various views of detached parts of the machinery represented at figs. 10, 11, and 12, and drawn to a larger scale, to exhibit the details more clearly. All these figures refer to machinery which may be applied, with suitable modifications, to boring rock and stone. The framework *a, a,* of the machine, upon which the whole of the working parts are mounted, is made of timber, or other suitable material, and is itself mounted on rollers or wheels, for facilitating the transport of the machine, and adjusting its position on to the spot where the work is to be done. These rollers or wheels may be made to run upon rails, or upon the ground, as convenience may suggest. The internal mechanism consists of two pairs of friction-cylinders or drums *b, b,* and *c, c,* which, when work is to be performed, are brought into contact, and are disengaged when the work is completed. These movements are effected by means of a treadle *e,* hereafter described. The drums *b, b,* are fixed upon a revolving-shaft *h,* supported by suitable plummer blocks and bearings fixed to the frame *a, a.* One end of the shaft *h,* is furnished with a crank, which may be worked either by hand or steam power. The drums *c, c,* are mounted upon a shaft, supported by and revolving in two slings or vertical bars *g, g,* the lower ends of which are jointed to the shorter end of the treadle *e;* when, therefore, the workman's foot presses down the opposite end of the treadle or lever *e,* (the fulcrum of which lever is at *e**,) the slings *g, g,* will be lifted up. The drums *c, c,* are thus brought into contact with the drums *b, b;* and, by means of the pressure and friction of the drums *b, b,* the former are made to revolve. The drums *c, c,* are further guided against *b, b,* by means of the lateral pressure of the small rollers *d, d.* On the shaft, which carries the drums *c, c,* is mounted a winding-drum or barrel *f,* which revolves with them, and winds up the rope *i,* which passes over the pulley *k,* at the head of the frame *a, a.* The rope *i,* is attached, at

one end, to the drum *f*, and, at the opposite end, to the pair of clippers or jaws *x*, similar in construction to those ordinarily used in pile-driving engines for raising and detaching the monkey or weight. The said jaws or clippers *x*, catch hold of the head of the boring-bar *u*, by means of the button-head *w*, shewn best at fig. 7. The boring-bar *u*, is kept vertical, or true to its work, by means of common guide-pieces *v*, *v*, through which the bar *u*, works vertically. The cutting or boring part of the bar *u*, (shewn at *z*, *z*,) is formed into a peculiar shape, like the letter *z*, as shewn in the detached views fig. 9, which represents, in perspective, the lower ends of two boring-bars, drawn on an enlarged scale. The operation of boring or drilling a hole in a rock or stone is effected by raising the bar *u*, to the requisite height, by the clippers *x*, catching up the button-head *w*, and then suddenly releasing the bar, by opening the jaws of the clippers, and allowing it to fall upon the rock or stone beneath. An attendant stands by the bar *u*, and, after a succession of blows (or at each blow, if thought desirable), he slightly turns the bar round, so as to cause the cutting edge to strike the stone in a new place. If the weight of the bar *u*, is sufficiently great, the drums *b*, and *c*, will be kept in contact, and will revolve without the aid of the workman's foot on the lever *e*; and the moment the weight of the bar *u*, is disengaged from the clippers *x*, the drum *c*, will, by its own gravity, fall out of contact and cease revolving; or the workman may remove his foot from the lever *e*, and then the drum *c*, will be thrown out of contact. If the weight of the clippers or jaws *x*, is sufficient to overcome the friction and weight of the shafts and wheels *c*, *f*, and *g*, and the pulley *k*, above, the jaws *x*, will descend and pull down the rope *i*, and re-engage the button-head *w*, of the bar *u*; and, by again depressing the lever *e*, the bar *u*, will be drawn up a second time; and thus the operation may be repeated continually.

It will be obvious to any intelligent mechanic, that, if the machinery is made of suitable strength, and the jaws *x*, instead of being made to engage a boring-bar, as shewn in the drawing, be made to take hold of and raise the monkey or weight of a pile-driving engine, the above-described apparatus will, with very little modification, be applicable to the driving of piles, and may be rendered almost self-acting, and made to operate with great rapidity,—a suitable motive power being employed.

Figs. 10, 11, and 12, represent a different method of raising and letting fall the boring-bar *u*. In place of the mechanism just described, a wheel *n*, is fixed upon a shaft *o*, supported

upon suitable bearings or brackets fixed to the frame *a*, *a*: the end of the shaft *o*, has a crank attached, which may be caused to revolve by manual labor or other motive power, as in the other machine. The cylindrical wheel *n*, (shewn detached, and drawn upon an enlarged scale at figs. 13, 14, and 15,) has a deep flange or rim *y*, cast all around on one side; and a narrow bead border the other side of the cylinder. A wedge-shaped piece or block *s*, is cast on the circumference of the cylinder, and the high part of the wedge is attached to the deep flange *y*, and tapers downwards across the cylinder to the bead or lower flange on the other side. A moveable pulley *l*, with its supporting bracket *m*, is pinned or bolted to the frame *a*,—the bolts passing through holes, bored at suitable intervals from top to bottom of the upright leaders or standards of the frame (see figs. 10, and 12). When the shaft *o*, is made to revolve with the wheel *n*, the rope *i*, on completing a revolution, comes in contact with the wedge-piece *s*, and, the revolution being continued, the rope, instead of winding on the cylinder, rides up and is forced off suddenly; and this action has the effect of suddenly removing the whole of the rope just wound up on the cylinder *n*. The rope *i*, which, during the revolution of the cylinder *n*, had elevated the boring-rod *u*, being now slackened, the borer will descend by its own weight and strike the stone; and, by repeating these blows, a hole is cut in the rock or stone. The boring-rod *u*, is guided, as already described, by guide-pieces *v*, *v*; but, in this case, it is not necessary to detach the hold of the rope from the boring-bar, which is always secured to the rope *i*, at the loop or eye *w*. When the boring-bar has cut to such a depth that the rope *i*, is not long enough to admit of the bar descending further, the attendant must ascend the machine by a ladder, or other suitable contrivance, and remove the bracket *m*, and pulley *l*, (over which the rope *i*, passes) to a lower station on the leaders of the frame *a*. This operation must be repeated as often as necessary,—holes being made in the leaders of the frame *a*, *a*, for the purpose of allowing the bracket *m*, to be secured at different altitudes, according to circumstances.

Another method of lengthening or shortening the quantity of rope is shewn in the plan view, fig. 11, and in the detached figs. 13, 14, and 15. *p*, is a wheel or cylinder, having a deep flange on one side, and running loose on the shaft *o*, alongside of the fixed wheel *n*, before described. On the nave or boss of the wheel *p*, four or more notches *r*, (see fig. 15,) are cut or cast in such a manner that a small hand-lever or trig-

ger *q*, (fig. 14,) whose fulcrum is in the fixed wheel *n*, may fit into any of them. Now, supposing that it were necessary to lengthen the quantity of rope, owing to the descent of the boring-bar into the hole that has been cut, the trigger *q*, must be withdrawn from the notches *r*, and the wheel *p*, is made to turn on the shaft *o*, until a sufficient length of rope is let out: the trigger *q*, is then replaced in one of the notches. It must be observed that the rope passes off the wheel *n*, through a hole in the flange *y*, at *t*, on to the wheel *p*, where it is wound up to any required length.

The patentee claims, First—(in relation to machinery or apparatus for cutting, facing, or dressing stone or other like substance), the employment of cutters formed of circular plates of metal, mounted, either singly or in sets, on a shaft or spindle; such cutter, so mounted, being made to pass over the surface of the stone or other like substance to be operated upon, with a rolling motion; so that the cutters, being pressed on the surface of the material, may cut down, or reduce to the required form, all projecting parts. He also claims the use of the circular plates when mounted in a rotating stock, as shewn at fig. 6; in which arrangement the cutters are made to act by impact, or by striking the surface of the stone instead of pressing against it, as in the former instance. Secondly—(in reference to machinery for boring rocks), the arrangement or combination of the friction-cylinders or drums *b*, and *c*, and the rope-barrel *f*, with a lever, treadle, or other means, whereby the drum *c*, may be raised or brought into contact with the driving-cylinder or drum *b*, and thus cause the barrel *f*, to raise the boring-tool, by winding up the rope *i*. Thirdly,—the arrangement of parts shewn at figs. 10, to 15, inclusive, or any mere modification thereof, for effecting the above-mentioned object. And, Lastly,—the employment of either of the arrangements referred to in the second and third claims, or any modification thereof, for the purpose of raising the monkey or weight of machinery for driving piles.—[*Inrolled May*, 1850.]

To Alfred George Anderson, *of Great Suffolk-street, Southwark, Surrey, soap manufacturer, for improvements in the treatment of a substance produced in soap-making, and its application to useful purposes.*—[Sealed 20th April, 1850.]

In the preparation of ley for making soap a substance is produced which is known by soap-makers as "soaper's waste

ashes" or "soaper's waste," and consists principally of carbonate of lime, with a little alkali, and a large quantity of quick-lime; and hitherto this has not only been considered useless, but the soap-maker has been put to some expense for the purpose of removing the same. Now this invention consists in obtaining from such substance neutral carbonate of lime, suited for all the purposes to which carbonate of lime is usually applied, and for manufacturing what is known in commerce as "whiting" or whitening."

The patentee introduces the soaper's waste ashes or soaper's waste into a cistern with some water, until the cistern is nearly full; he stirs the same until the finer portions of the waste are suspended in the water; after which he permits it to rest for five or six minutes, in order that the grosser particles may subside; and he then draws off the liquid into another cistern, and allows it to settle. The deposit, thus obtained, consists of carbonate of lime, mixed with alkali and quick-lime; and the two latter may be removed by washing with water until the water comes away tasteless. But as this operation would require a large quantity of water, and be productive of much inconvenience, the patentee prefers to add to the mass a solution of carbonated alkali, in sufficient quantity to convert all the quick-lime into carbonate of lime; and then the alkali may be readily removed by washing with a small quantity of water, leaving the carbonate of lime quite pure. The carbonate of lime may now be treated in the manner ordinarily practised by manufacturers for the purpose of producing whiting or whitening. As the water which has been used for washing the carbonate of lime contains alkali, it may be used, instead of pure water, in the preparation of ley.

In conclusion, the patentee says, "Now I claim the application of soaper's waste ashes or soaper's waste to the manufacture of pure carbonate of lime, and of the substance called, in commerce, whiting or whitening. And I also claim the application of soaper's waste ashes or soaper's waste to the manufacture of pure carbonate of lime, and of the substance called, in commerce, whiting or whitening, in the manner described; but I do not confine myself to the exact mode of manipulating I have detailed, so long as the general character of my invention is retained, which is, to make from soaper's waste ashes or soaper's waste neutral carbonate of lime and the whiting or whitening of commerce."—[*Inrolled October*, 1850.]

To John Sheafe Gaskin, jun., *of the Island of Barbadoes, in the West Indies, Gent., for improvements in the manufacture of rum,—to extend to the colonies only.*—[Sealed 31st July, 1850.]

In the ordinary mode of manufacturing rum, skimmings (obtained in the manufacture of sugar from the cane-juice), "sweet water" (wash-water), and molasses, are mixed together and fermented, in order to obtain the wash from which the rum is to be distilled. The skimmings and sweet water are added, in the rough and unclarified state, to the molasses, and without regard to the quantity of saccharine matter contained in each; and this is also the case when the juice of rotten canes is used: whereby repeated skimmings, during the fermenting process, are rendered necessary, and the time occupied by the process of fermentation is extended to an injurious extent (from ten to fourteen days). There is also a want of proper cleanliness in the vats, pumps, and other apparatus, and in the building in which the operation is conducted; and the interior of the building is kept in a hot and close state. These circumstances all tend to the production of acid, and cause a portion of the liquor to pass from the vinous to the acetous fermentation: loss therefore ensues—the "dunder" or residue containing a quantity of saccharine matter; and it has been customary to mix the dunder with the next quantity of liquor which is to be fermented.

Now, according to this invention, the vats, pumps, pipes, and other apparatus, are to be kept in a perfect state of cleanliness by the use of lime and water, so as to remove and prevent acidity. The exterior of such apparatus and the interior of the building are to be kept "lime whited." The building is to be kept in a cool state by the admission of atmospheric air. The skimmings, sweet water, and the juice of rotten canes are to be clarified before they are mixed with the molasses. In order to clarify the skimmings they are placed in a suitable copper or iron vessel, and heated to 212° Fahr.; the fire or other source of heat is then removed, and the skimmings are allowed to cool for about half an hour; after which cream of lime is stirred in until all traces of acidity are removed (as may be ascertained by testing with litmus paper); and then the clear liquor is drawn off. The sweet water and the juice of rotten canes are clarified in the same way as the skimmings. The clarified liquors are to be mixed with the molasses in such proportions that the specific gravity of the mixture will be from 1·050 to 1·054; but it is preferred to

employ a mixture of less specific gravity when the climate will permit. The patentee prefers to commence the process of fermentation at 80° Fahr., from which the heat will gradually increase to 90°, 95°, and even 96°; but if it rises to 100° at an early part of the process, or before the specific gravity of the mixture is reduced to 1·020, it is an indication that a mixture of less specific gravity should be used. If the process of fermentation is proceeding in a proper manner, the attenuation should take place at the rate of one degree or thereabouts in each hour, during the first twelve hours, and to a greater extent after that;—the process generally being completed in about three days. If the fermentation has gone on in a proper way, the dunder or residue will be valueless; but when it does contain any saccharine matter, it is to be fermented by itself, and the product added to the product of the before-mentioned fermentation. The wash, obtained by the above process of fermentation, is now to be put into the still. The first rectifier should be nearly filled with low wines; and one-eighth of a gallon of common salt is to be added for each gallon of low wine, together with about two gallons of recently-expressed cane-juice. The second rectifier should be charged with a quantity of spring-water or rain-water equal to the quantity of low wines contained in the first receiver—about thirty gallons. The first gallon of rum that comes over is to be put into the low wines butt. In the upper part of each receiving-can is placed a wicker basket, filled with vegetable charcoal, through which the rum filters into the can, and is thereby improved.

The patentee states that he does not confine himself to the above details, provided the peculiar character of his improvements be retained.—[*Inrolled September*, 1850.]

To Richard Holdsworth, *of the firm of Holdsworth & Co., cotton spinners, and* William Holgate, *engineer, both of Burnley, in the county of Lancaster, for improvements in apparatus and machinery for warping worsted, cotton, and other fibrous materials.*—[Sealed 11th March, 1850.]

This invention consists in certain apparatus for communicating motion to warping-mills from a steam-engine or other first mover, for the purpose of enabling the same to be readily put in motion, stopped, or reversed, as required.

In Plate XI., fig. 1, exhibits an elevation of one arrangement of apparatus. *a*, is a vertical shaft, which carries two

discs or face-plates *b*, b^1, and is driven by a band, from a steam-engine or other first mover, passing around the pulley *c*. *d*, is a horizontal shaft, connected at one end with the warping-mill, and carrying at the other end a friction bowl or roller *e*, which is shewn in contact with, and consequently receiving motion from, the lower disc b^1; but if it be desired to stop the warping-mill, the shaft *d*, is raised to such an extent that the roller *e*, will be situated midway between the two discs, and not in contact with either of them; or if it be required to reverse the motion, the shaft *d*, is elevated still higher, so as to bring the roller *e*, into contact with the upper disc *b*. The shaft *d*, is raised by turning the hand-wheel *f*, fixed on the end of a short shaft or spindle *g*; this spindle is formed with a small tappet *h*, which works in an opening in the upper part of the rod *i*, so as to elevate the rod when the spindle is turned; and as the bearings of the shaft *d*, are attached to the lower end of the rod, the shaft *d*, will likewise be raised when the spindle *g*, is turned. *j*, and *k*, are chain-wheels; but the patentees do not state for what purpose they are employed.

Fig. 2, represents a modification of the arrangement of apparatus shewn at fig. 1. In the present instance, the hand-wheel *f*, is fixed on the top of a screwed rod *l*, which works in a female-screw or socket at the upper end of the rod *i*; and therefore when the rod *l*, is turned, by means of the wheel *f*, the rod *i*, and shaft *d*, will be raised. In order that manual labour may be employed, as well as steam power, for driving the warping-mill, the shaft *d*, is connected by the bevil-wheels *m*, *m*, with an upright shaft *n*, having a handle *o*, at the top, to which manual power is to be applied.

The patentees claim, as their invention, "the application and arrangement, in combination, of the several parts of the machines or apparatus constructed as hereinbefore set forth, described, and illustrated."—[*Inrolled September*, 1850.]

To James Preece, *of the City of Hereford, shoemaker, for certain improvements in mills and machinery, applicable to the thrashing and grinding of corn, the manufacture of cider, and other similar purposes.*—[Sealed 26th March, 1850.]

This invention consists, firstly, in so arranging the machinery of water-mills that, when there is a scarcity of water, manual labour may be easily applied, so that the mill may be

worked jointly by water and hand power, or wholly by water, or wholly by manual labour, as circumstances may require. Secondly, in the application of two driving-wheels to one pinion, so that two or four handles may be applied to hand corn-mills, thrashing machines, and pulping or grating machines for grinding apples to be used in making cider;—which machines may also be used for reducing any other kind of fruit employed in making wines, and for grinding turnips, potatoes, and other roots and vegetables, as food for cattle, and for making arrow-root, starch, and so forth: this addition to hand-mills is likewise applicable to malt-mills, linseed-mills, and mills for crushing and bruising oats, beans, barley, Indian corn, linseed, &c.; and it is also applicable to the driving of machinery, such as lathes and other apparatus worked by handles and requiring more than two men to perform the work. Thirdly, this invention consists in applying three driving wheels to machinery of the kinds mentioned under the second head, so that six handles may be applied and used for the performance of any additional labour that may be required.

In Plate XII., fig. 1, is a vertical section of a flour-mill, the machinery of which is arranged suitably for being driven by water power or manual labour, or both. *a*, is a bevil toothed-wheel, fixed upon the shaft of the water-wheel, and gearing into the bevil-pinion *b*, fixed on the lower part of the vertical shaft *c*; this shaft carries, at its upper end, a large spur-wheel *d*, which gears into two spur-wheels *e*, *e*, mounted respectively on two shafts *f*, *f*; and these shafts each carry, at their lower end, a spur-wheel *g*, in gear respectively with three pinions *h*, *h*, fixed on the vertical shafts *i*, *i*, that drive the mill-stones, which are placed on the upper floor of the mill, as shewn at *j*, *j*. Motion is thus communicated to the mill-stones from the water-wheel; and, when required, manual labour may be employed in aid of the same, by inserting hand-spikes or levers *k*, *k*, into the openings of the capstan-head *l*, which is fixed on the shaft *c*. The shaft of the water-wheel should be furnished with a clutch-box, or other suitable means of disconnecting the same from the shaft *c*, when it is desired to work by manual labour alone.

Fig. 2, is a side elevation of a thrashing-machine, furnished with two toothed driving-wheels *a*, *a*, which gear into a pinion *b*, fixed on the end of the shaft that carries the drum or beater-wheel of the machine. The wheels *a*, *a*, are put in motion by manual labour, applied to the winch-handles *c*, *c*, on the spindles of those wheels.

Fig. 3, is an elevation of a thrashing-machine, provided with

three driving-wheels *a, b, c,* which are turned by means of winch-handles, fixed on each end of the shafts thereof. The wheels *a, c,* gear into the wheel *b,* the shaft of which carries a larger spur-wheel *d,* that gears into the pinion *e,* fixed on the end of the drum-shaft.

The patentee claims, First,—the application of manual labour to the working or partial working of mills that have heretofore depended wholly on water power. Secondly,—the application of an extra driving-wheel and handles, as shewn at fig. 2, to thrashing-machines, cider and other mills, and machines that have heretofore been worked by hand power. Thirdly,—applying to the like purposes as above, two extra driving-wheels and the corresponding handles, as shewn at fig. 3. Lastly,—the use of bands for driving the several machines and mills described, instead of wheels with teeth or cogs. [No reference is made to this part of the invention except in the claim, as given above.]—[*Inrolled September,* 1850.]

To Eugene Alexandre Desire Boucher, *of Paris, metal manufacturer, for certain improvements in the manufacture of cards.*—[Sealed 1st August, 1849.]

This invention relates to the wire cards used for carding cotton and other fibrous materials, which are made by inserting short bent pieces of iron wire into a back of leather, gutta-percha, India-rubber, or any suitable fabric, so as to form a kind of wire brush; and it consists in coating such wire, previous to its employment in the manufacture of cards, with a metal which is less oxidizable than iron.

There are several inconveniencies attendant upon the use of the ordinary unprepared iron wire: first, by reason of the tendency of iron to oxidize when exposed to moisture, that part of the wires which is imbedded in the sheet or band of leather or other material, is liable to become rusty and brittle, owing to the dampness of the fibrous material operated upon; secondly, the stems of the wires which project from the leather back, are liable to become oxidized from the humidity of the atmosphere, and to have their surfaces thereby rendered irregular and rough, so that they will tear the fibrous materials submitted to their action; and thirdly, the oxide or rust, which is detached from the wires in the operation of carding, gives an objectionable reddish color to part of the cotton or other fibrous material. The patentee therefore proposes to coat or cover the iron wire with a metal which is less oxdizable

than iron, such as copper; and he describes two processes for coating the wire—one by simple immersion, and the other by electro-deposition.

The process for coating the wire by simple immersion is as follows:—A solution is prepared by adding one ounce of sulphate of copper and half an ounce of sulphuric acid to five gallons of water, at a temperature of 86° Fahr. When the solution is cold, the iron wire is drawn through it, and thereby becomes coated with copper [termed, by the patentee, red copper]; and the wire is then drawn through the plate of a common draw-bench, for the purpose of rendering the coat of copper perfectly even and causing it to adhere to the wire. The operations of immersing the wire in the solution and subjecting it to the action of the draw-bench, are repeated, until a coating of the desired thickness is obtained.

In order to coat the wire by electro-deposition, it is wound upon a metal reel, which is connected by a metal strap with the negative pole of a voltaic-battery, and is immersed in a bath composed of two pounds and a quarter of yellow cyanure of potassium and iron, four pounds and a half of bicarbonate of potash, and five gallons of water, at a temperature of from 48° to 56° Fahr. In this bath a plate of copper is also immersed, and is connected by a wire with the positive pole of the battery. By this means the wire will be coated with copper; and it may be afterwards passed through a draw-bench for the purposes above mentioned. Wire may also be coated, by this process, with "yellow copper," tin, brass, zinc, lead, and other metals. The patentee likewise states that he manufactures cards with wire which has been coated with zinc by any of the galvanizing processes already patented.

He does not confine himself to the above details; but he claims, First,—the constructing cards, for carding fibrous substances, with iron wire, rendered inoxidizable by the application of a coating or covering of another metal far less oxidizable than iron. Secondly,—the processes for obtaining the said coating as above described.—[*Inrolled February,* 1850.]

To Josiah Marshall Heath, *of Hanwell, in the county of Middlesex, Gent., for improvements in the manufacture of steel.*—[Sealed 6th September, 1849.]

This invention consists in manufacturing steel from iron which has been produced from the ore without being brought into the state of pig or cast iron,—such iron being manufac-

tured by a process invented by the patentee, which renders it more suitable for conversion into steel than any iron made by the ordinary processes.

Before describing the method of carrying out the invention, the patentee makes some introductory remarks, to the following effect:—The excellence of steel depends upon the comparative purity, or freedom from mixture with extraneous substances, of the iron from which it is made. Iron made by smelting ores in a blast furnace contains impurities, in consequence of the alloys formed between the fluid metal and the earthy, alkaline, or other extraneous substances contained in the ores, the fuel, and the matters used as fluxes; and these impurities cannot be completely removed from the iron by the operations in use for converting pig iron into malleable iron. All the iron used for manufacturing steel in this country is made from pig-iron, and consequently contains more or less impurity. The nearest approach that can be made to the production of pure iron is by deoxidating pure iron ores by the common process of cementation with carbon; however, the metallic product obtained by this means, upon a manufacturing scale, is unfit for the manufacture of good steel without further preparation; but when it is treated in the manner hereafter described, the result is an iron fit for producing steel of finer quality than that heretofore manufactured from the best foreign iron.

Any pure ore or oxide of iron, from which the earthy or other extraneous matters can be readily separated by crushing, winnowing, washing, or magnetic attraction, may be treated according to this invention; but the magnetic ore of iron is preferred. The ore is to be reduced to the state of grains, or into fine powder, in order to facilitate the separation of the earthy and other extraneous matters from it; and, after such separation, the pure ore is to be reduced to the metallic state by any of the ordinary processes for depriving the metal of oxygen, by acting upon it with carbon or other reducing agent at a heat below that which would bring the metal to the fluid state. The metallic product thus obtained, when working upon a manufacturing scale, is never absolutely free from earthy or other impurities, and always contains some portion of oxide of iron, which renders it unfit for conversion into steel of good quality without further treatment. Now, to make a perfect steel iron, the patentee mixes with the metallic product a small portion of oxide or chloride of manganese and some coal or fir tar, or any cheap hydrocarbon or carbonaceous matter: he does not confine himself to any fixed proportions

of these matters; but he states that he has obtained the best results from the addition of from one to three pounds of oxide or chloride of manganese and from one to two gallons of coal or other tar to each hundred pounds of deoxidated ore. This mixture is heated in a suitable furnace; and when the iron is at a welding heat, it is removed from the furnace, and subjected to the action of some suitable compressing instrument, in order to form it into a bloom. The bloom is then re-heated and shingled, hammered, or rolled into bars in the ordinary way; and the bar-iron, thus produced, is converted into steel by the usual processes.

The patentee does not claim, as his invention, any process or apparatus for reducing iron ores to the metallic state by cementation or deoxidation; but he claims the treatment of the metallic product, obtained from iron ores by deoxidation, in the manner above described, and the application of the iron so produced to the manufacture of steel, by whatever means the conversion of the said iron into steel may be effected.—[*Inrolled March*, 1850.]

Scientific Notices.

FACTORY LABOUR AND ITS EFFECTS.

> "An inventive age
> Has wrought, if not with speed of magic, yet
> To most strange issues."
>
> THE EXCURSION.

THERE are few subjects more suggestive of anxious thought, or more deserving of patient enquiry and consideration, than the social condition of the manufacturing population of this country, from whose labours we derive most of the necessaries and not a few of the luxuries of life. Were it not that this class had given to the world frequent examples of men endowed with great mental powers, and capable, like the Corn-law Rhymer, not merely of obtaining a hearing, but of impressing their opinions upon the more intelligent portion of our countrymen, their numbers alone would have ensured them the attention of the legislature, which, although most cautious, even to timidity, in interfering with the rights of the employer, has given many signal proofs of a desire to ameliorate the condition of the employed. It is not, therefore, the want of a judicious parliamentary supervision so much as their general deficiency in self-culture that suggests to the mind of the thoughtful enquirer a series of undefinable fore-

bodings as to the results of the future working of the factory system; for, all that direct enactments can effect (at the present time) for the good of the operative classes has perhaps been achieved; while much of remedial evil, and many fruitful sources of its growth, remain unchecked, and even little heeded. But, if it is as vain (as some would have us think) to attempt the training of the mature uncultivated man as of the full grown tree, it would be at least wise to try the working of a gentle discipline upon the young—those "problems (as they have been aptly termed) awaiting man's solution"—and see if the flood of evil, which associated ignorance must inevitably engender, may not be permeated with some streams of healing waters. We think it needless to offer any apology for the introduction of this subject to the notice of our readers, from its close connection with the welfare of the manufacturing interests of this country; our design is not, however, to sketch out a system of education for factory children, but to give, as a chapter towards that desirable object, a few connected thoughts, suggested by a recent hasty glance at the manufacturing districts of the north; for, however much the rapid development of mechanical ingenuity may induce prosperity, and thereby keep under the natural restlessness of the manufacturing population, we cannot but feel with the poet—

> "How insecure, how baseless in itself,
> Is the Philosophy whose sway depends
> On mere material instruments:—*how weak*
> *Those arts and high inventions, if unpropped*
> *By virtue.*"

Whether it be that custom has hardened us to the sight, or that our observation lacks discernment, we know not, but certain it is, we cannot sympathize with those who piteously lament over the hard lot of factory children; for, rarely have we seen, among children of the operative classes, a more genuine display of contentment than in the faces of those we lately noticed congregated in their busy hives of industry. Up to a certain point, we think the practice of putting young children to light labor is wholesome rather than disadvantageous; but, inasmuch as in many manufactures their assistance is deemed a necessity, and the legislature has apparently exhausted its powers of interference with juvenile labour, it is imperative that all considerations of this subject, pursued with the view of improving the condition of the children, should be based on the assumption that the period of labour is now fixed at its minimum; as, otherwise, whatever may be the abstract merits of the theory resulting therefrom, it will fail of utility from the want of being carried into practice. We have said

that, up to a certain point, the early addiction of children to some industrial occupation will tend to their benefit: this may startle the denouncers of "white slavery," who can see no possible advantage from this early training than gain to the employer;—we think, however, it admits of demonstration—for a casual glance at the internal arrangements of a cotton-mill, for instance, will shew that the discipline there enforced, tends to carry out some of the principal objects for which infant schools were founded, namely, to secure the attention of the children, and arouse their perceptive faculties. This being effected (a result rarely obtained in the children of the agricultural labourer), a great point is gained; and further, the practice of industry (a thing naturally repugnant to humanity) is at the same time acquired. Here, however, we meet with a difficulty; for no sooner has the labour of the child reached a money value, than its days of instruction are virtually at an end; for the parents, in realizing the present satisfaction of having one mouth less to feed, too often sacrifice, without consideration, the future prospects of their offspring. If not wholly debarred from the benefits of education, by continuous application to work, the factory child, it is evident, is, by lengthened indoor occupation, rendered unimpressible by ordinary school discipline, which is calculated rather to repress than encourage relaxation. Speaking generally, we should say that children are incapable of mental recreation—that is, irrespective of the outward senses,—and so we fear are a large portion of adults; the transition, therefore, from spindles to a copy-book or primer, is hardly the diversity of occupation that would be relished by the liberated juvenile operative; a mental training of a very different character to that which has been found to answer in our national and parish schools should therefore be adopted. But before we make any suggestion as to the kind of education suitable for these children, it may be well to look to the circumstances by which they are surrounded, and trace the effects which their situation is calculated to work upon them. If our knowledge of the internal arrangement of a cotton-mill (to retain the example already used) would allow us to follow a child, from his first entrance at the portal, within which is

> "Almost a soul
> Imparted to brute matter,"

and mark the stages of his progressive advancement from one branch of occupation to another, until he has acquired that skill, and those habits of attention, which fit him for being drafted off to some permanent employment, it would be un-

necessary to furnish such details; for all we could wish to shew is, what we think will be generally admitted, viz., that a child, after a few months' instruction, is as capable of performing the class of duties entrusted to the young as he would become by years of experience. The demand made on muscular exertion is but slight (unless the continuance of labour be taken into account), and the powers of the mind are even less exercised, after the child's attention has once been secured. In many cases an action is to be performed by a certain number of motions, so that not one is wasted; and speed, the only thing of importance (judgment not being called into requisition), is soon acquired. In others, the exercise of watchfulness of eye and facility of fingering are demanded; and these are attained to perfection by children of from eight to ten years of age. The teaching of factory children begins, therefore, on their first crossing the threshold; and, when they have acquired habits of industry, combined with a quickness of perception (howbeit limited in degree), and a kind of mechanical dexterity—things of vast importance, as respects success in after life—they have imbibed all the good they are likely to receive within the mill. Thus much, then, is to be said in favor of the factory system; but the value of this early training is hardly to be appreciated to its full extent—neither, indeed, is the evil, which will be hereafter pointed out as flowing from the system, to be thoroughly understood—without comparing the man who has received such training in his childhood, with the labourer who has missed it, and yet received no other as an equivalent in the national or parish school. A fair sample of this neglected class would be the agricultural labourer: for here, instead of the shrewd active artizan, possessed of a will of his own, and ready with his aid for any cause that suits his fancy, we have the dull plodding harmless farmer's labourer, whose lazy movements, tending to indicate debility, belie his ruddy face and sturdy frame, and shew that time (to him at least) is of no value.

"Then mark his brow!
Under whose shaggy canopy are set
Two eyes—not dim, but of a healthy stare—
Wide, sluggish, blank, and ignorant, and strange—
Proclaiming boldly that they never drew
A look or motion of intelligence
From infant-conning of the Christ-cross-row,
Or puzzling through a primer, line by line,
Till perfect mastery crown the pains at last.
—What kindly warmth from touch of sun or breeze,
Shall e'er dissolve the crust wherein his soul
Sleeps, like a caterpillar sheathed in ice?
This torpor is no pitiable work
Of modern ingenuity."

Surely no one can call this picture of the poet's overdrawn; it is rather the verisimilitude of the original. But what a contrast this to the condition of the man whose early years were spent amid the triumphs of the mechanic arts! The labourer's only chance of awakening his slumbering faculties is through the aid of that military despot the drill-serjeant, who, by quickening his physical energy, may effect for him—minus the habits of industry—what the mill does for the factory child. We have said, that the requisite dexterity for performing the duties of the factory being once acquired, the lesson is completed; and there is nothing else to engage the mind of the young operative,—no ulterior object to be gained by striving: this is a serious drawback to his advancement; for, when the perceptive faculties have been early—or, as it may not unreasonably be said, prematurely—awakened, and strung up to a certain pitch, it is, of all things, most desirable that they should be kept employed—that they should have food for reflection,—not so much from the fear of their collapsing, if allowed to slumber, as from their receiving a baneful application. We are by no means certain that the seeds of discontent are not sown early in the operative's mind, from this very cause; for, it should be remembered that, ordinarily, before the dawn of manhood, the plan of his life's labour lies open to his eyes, without a hope of beneficial change, or premium for capacity, glimmering on the page: "a ceaseless, changeless, hopeless, round of weariness" is apparently his lot. With such views in prospect, many, doubtless, enter life, possessed with the double experience that, as children, they were enabled to emulate lads in their industrial occupations (dexterity only being the touchstone), and that, in their turn, they were rivalled by their juniors. But this being a consequence of all occupations where the physical powers (but lightly taxed) are alone called into requisition, it should not be dwelt upon as if pertaining exclusively to the factory system; we must, however, before passing from this phase of the subject, remark, that monotony of occupation, although of comparatively little moment to the adult—whose mind we may suppose to have been formed—is very detrimental to the development of the mental powers of the child or youth; and, as such, it should be guarded against,—if not by employers, at least by parents. It should, however, be remembered, that monotony only begins when the labour ceases to engage the attention, and can be performed mechanically: up to this point, as we have before said, the discipline of the factory is a wholesome discipline.

Now, from the two facts above enunciated—viz., that the skill demanded from the operative is *quickly* acquired, and also that it is *early* acquired—arises the great and crowning evil of the factory system; and it is with this evil (which has been heretofore, in great part, if not wholly, overlooked) that the philanthropist, who desires to ameliorate the condition of factory children, should manfully grapple: it consists in this—that these young inmates of the mills (both boys and girls), perceiving that they can support themselves by their own labour, early assume an independence of parental government. It is well known what effect this feeling of independence frequently has upon the unripe heir of an entailed estate, whose mind has not been suffered to run wholly waste; it can therefore be no matter of surprise that the uncultivated operative, placed in a similar independent position, should copy the manners of his superiors in station, and hurry into follies which he has neither the wisdom nor the inclination to shun. By such conduct parents will often justly suffer the fruits of their own selfishness in hiring out their offspring, not from necessity, but for gain; unmindful of the advantages which education might have conferred upon them. Freedom from restraint, before the judgment has had time to ripen, or the habit of self-control has begun to form, is not only injurious to the being thus let loose upon society, but also to society itself. It is thus that almost all our criminals are formed, and not a few of our political firebrands, who, although held responsible for their acts, deserve scarcely less compassion than the pitiable lunatic. We have said that factory children are unsuited to receive the ordinary instruction of our schools; indeed, the attainment of information, and the means of increasing it (forming as they do the staple of instruction), are just the acquirements which can have no good effect upon such spirits as thirst for freedom from restraint: it is a means of developing their moral feelings, of educating their hearts to love and venerate what is deserving of esteem, that is required for the subjugation of turbulent and rebellious spirits; for, as judgment will only ripen in the man, kindly emotions must be the impelling power to goodness in the youth. These may be wanting where knowledge abounds; and, as knowledge is power, the unruly youth would, by such education, be so much the more hurtful to society; whereas, with a kindly heart, he must, of necessity, be a useful member; but with knowledge superadded, he might improve his own position, and feel a pleasure in other than sensual enjoyments. Now it is, we think, a matter deserving of grave con-

sideration, whether this kind of education could not be introduced, so as to counteract the evil arising to the unfledged operative from the want of the feeling of dependence, and, at the same time, raise him in the scale of social beings. That the idea is not altogether impracticable cannot be doubted; for, in some districts, an out-of-door supervision of all the hands employed has been carried out with great benefit to the employer and employed; and if an enquiry be instituted into the economy of that paradisal place for factory labour in the United States, where the morals of the operatives are said to be as free from taint as are their native skies from the foul canopies of smoke which we associate with cotton mills—it will be found that, despite the romance with which the subject is surrounded, there is truth in the assertion that the Lowell factories are unprecedented as respects the character and condition of the operatives employed. This arises from two causes;—first, all children, when arrived at a certain age, are compelled, according to the laws of the United States, to pass under public or private instructors, and remain under pupilage for a given period. Those, therefore, who are put to factory labour, have already received a certain amount of education; and, as a consequence, they come later to the mill than in this country;—from which circumstance, it arises, that their state of independence, or the time when they have thoroughly mastered their business, is deferred until they are somewhat nearer to years of discretion than with us. In addition to these advantages, they are subject to a rigid and constant surveillance,—such as reside from their parents being obliged to live under a sort of college discipline. These facts being taken into account, it is not strange that Lowell has been enabled to produce, for years past, an annual of no mean pretensions, compiled from the literary labours of the factory operatives. We would commend this subject to the especial attention of our manufacturers, for whom, as with no other class, it should be rife with interest;—reminding them at the same time that, as it is through their influence alone that any rational plan for effecting the permanent elevation of the operative classes can be carried out,—so, by neglecting to use that influence, they will most certainly incur the penalty which associated and misguided ignorance never fails eventually to inflict.

ELECTRICITY APPLIED AS A MOTIVE POWER.

Now that the experiments of Professor Page, of Washington, appear to have elucidated some truths in electro-magnetism, which render it somewhat more than probable that a valuable motive power will emanate therefrom, there are not wanting competitors for the honor (howbeit as yet prospective) which awaits the successful investigator in this field of science. The immediate cause of this demonstration of opposition to the Professor's claim, as the discoverer of an economic means of applying electricity as a motive power, no doubt arises from the importance attached to his recent public exposition at Washington of the capabilities of his apparatus, which drew forth so much admiration from his scientific auditors, and has of late formed the constant subject of conversation in scientific circles in this and other countries of Europe; but, during the long period in which he was engaged in working out his theory, and while at distant intervals he was publishing his yet undigested plans (some of which have been recorded in our Journal), we heard of none desirous of sharing his anticipated rewards, although many, doubtless, were pursuing, independently, the like labours. Two compatriots are, however, already in the field, desirous, it would seem, of snatching the wreath which appears destined to fall on the head of their more fortunate fellow citizen; but their claims must, we think, be somewhat wide of the mark, as the details of Professor Page's plan have as yet been held back, with the view of securing his invention in Europe. The first of these claimants is a Mr. Hubbell, a counsellor of Philadelphia, who, in a letter addressed to the Committee of the Franklin Institute, and published in the August number of their Journal, together with a copy of his specification, dates his invention of the "Solar Magnetic Engine" as far back as December, 1841. The following extract from his specification will give a general notion of his invention, which we have no reason to think touches at all upon Professor Page's:—

"The principle or character of my invention is based upon principles which I have deemed, as a guide in developing my invention, to exist in the solar system of the universe; and being intended by me, so far as may be necessary to obtain an organized mechanical power and motion, as an imitation of the solar system, I have thought proper, for elucidative purposes, to designate my invention the 'Solar Magnetic Engine.' Its nature is based in imitation as follows:—I suppose the sun or centre of the system to be possessed of the magnetic principles of attraction and re-

pulsion, and exercising these influences at every point of an unbroken circumference around a common centre or axis; its face possessing equal capacity of power at any circumferential, with any other parallel circumferential point, to attract direct to, and repel directly from this common axis or centre.

I therefore construct a centre or solar magnet, to embody within its known nature these aforesaid principles. This magnet, with the variable modes that have occurred to me of constructing it, are hereinafter described.

To imitate the planets revolving about, and governed by the sun and each other, as far as, for my purpose of attaining available power in machinery, is necessary, I have one, two, three, eighteen, or fifty, more or less, magnets vested with attractive and repulsive power, and playing about and governed by a common centre, not coincident with the centre of the solar magnet, but so fixed near it, that these planetary magnets, by mutual attraction between each of them and the solar magnet, approach from their aphelion or farthest point of recedure, to their perihelion or nearest point of approach to the solar magnetic surface; and then by changing their poles relatively to this surface, when, or as they successively reach the nearest point of approach, they of the planetary and the solar magnet repel each other, until the receding planetary magnets respectively arrive again at their aphelion or point of farthest recedure, where their poles again rechange, and they of the planetary and the solar magnet attract each other; and thus the planetary magnets successively change at their points of aphelion and perihelion, and approach near to, and recede from, and revolve around the solar magnet; which solar magnet, at its every circumferential point, exerts its power on the revolving planetary magnets; and as within itself, owing to its formation, it concentrates and embodies, to and from its common centre, a great and uniform capacity of attractive and repulsive nature, so also when combined with the planetary magnets, it developes an uniform and continuous power for practical use, as an universally appropriative power."

The second competitor is a Mr. Davenport, of Salisbury, Vermont, who sets forth his claims in the columns of the *Brandon Post:* these have been commented upon in the *Scientific American*, from which we extract them, together with the Editor's remarks:—

"We have received a copy of the Brandon Post, Vt., with an article marked for our notice. It is from the pen of Thomas Davenport, of Salisbury, of that State, the man who constructed the first electro-magnetic engine in the world. He first quotes the article which appeared in our columns about Professor Page's experiments, and then goes on to say—

'As I am confident that the results of the experiments of this enterprising and scientific gentleman will open the eyes of the people, and the purses of capitalists sufficiently to soon place

upon our rivers, lakes, and railroads, a safer, more convenient, and cheaper power than steam, I hope I may not regret so much in future as I have for ten years past, that the paralyzing hand of *poverty* has forbidden any attempt in myself to prove to the world, what, as early as 1833, I believed could be done in the space of five years. At that time, galvanism appeared to me to have the same relation to the power of an electro-magnet, that water does to the power of a steam-engine; and I had no doubt but I could convince the whole sensible world of the fact, by fairly applying the power of a small electro-magnet to moving the lightest machinery. But I was disappointed. I found the power more controllable than the minds of men, and compliments more plentiful than money.'

He then states that he spent 17 years in applying electro-magnetism to useful purposes; and in 1838 ascertained that a bolt of iron could be drawn with great force into a helix of wire whenever the battery current was suffered to pass through the coil; and he then made an engine on this principle with two cylinders, very much like steam-cylinders; for this invention he filed a caveat in our Patent Office, and sent several models to Europe, and obtained a patent in England, and a number of other European kingdoms.

In 1839, he experimented on a large scale with a magnetic helix two feet in length; and a bolt of iron two feet long and 2½ inches in diameter was forced into the helix with a power equal to 6 lbs. on the square inch. In January, 1840, he made an engine with two magnetic cylinders, weighing 50 lbs. each. The engine had a one-foot stroke; his battery weighed 200 lbs. In that month he commenced publishing a newspaper, which was printed on a press propelled by his engine: it made 120 strokes per minute, but worked off 10 papers in that time, or 600 in one hour: it was about one horse power. The price of zinc and acid did not, he says, exceed twenty-five cents per day—a very low estimate, we think. He has constructed more than a hundred electro-magnetic engines of different dimensions, and his experiments with helices, using long and short, large and small, hollow and solid bars of iron, were very numerous. He concludes as follows:—

'My press was first moved by a horizontal helix engine, next by a rotary, and lastly by a perpendicular double helix engine. Now as Professor Page's experiment with his 160 lbs. of iron 'dancing like a feather in the air,' seems to be precisely like the experiment I made in 1839, when the 28 lbs. of iron jumped through a helix two feet in length, by magnetic action, and, as the Professor's engine is constructed on the same plan and principle as my own, above described, I presume the scientific gentleman lays no claim to having presented any new route in his application of the power, or to have made any important improvement whatever in my invention. If Professor Page, by the completion of his engine, has finally come to the point at which I arrived ten years ago, in testing electro-

magnetism as a prime mover in the arts, and has expended as much money in a series of experiments which he, of course, would be obliged to make, I think I could have saved him the needless expenditure of several thousand dollars, by giving him the results of some of my experiments in 1838-9-40, which I should have been happy to do if I had been consulted in due time.'

It seems that Mr. Davenport is not aware of the fact that 20,000 dollars were appropriated to Professor Page for his experiments—that they did not cost him one cent—and after all, here is a poor man who attained as great results ten years ago."

These extracts carry with them sufficient evidence that the enquiry into the practicability of utilizing electro-magnetism has been earnestly followed out in the United States, whilst in Europe the subject has been neglected, from a conviction of the impracticability of maintaining a battery at a cost that would compete with the generation of steam power; if, therefore, anything of practical use to mankind is to come from this as yet incomprehensible power, we must naturally look to America as the pioneer to the discovery.

Scarcely, however, are we made aware of the existence of an engine which is to prove the applicability of electricity to all the purposes for which the expansive force of steam is now employed, than we are startled with an announcement, from the same inventive quarter of the world, that seems to hurry us from doubt to probability, and thence to certainty, as respects the settlement of the electro-magnetic question, in order that we may calmly contemplate the marvellous discovery which we have now to record. It will be remembered (for the American Journals have lately teemed with reports of the matter, controversial and otherwise) that a method of decomposing water by mechanical means, for the purpose of generating illuminating gas therefrom, was announced by the inventor, Mr. Paine, as capable of superseding the manufacture of coal-gas, and that he had given both private and public exhibitions to substantiate the truth of the facts which he had advanced, but which had been denied as impossibilities by the scientific world: this gentleman now comes forward with a second discovery, which is to convert ships into veritable fishes, and may possibly enable us to fathom the strange propensities which floating islands have to change their locality. In a letter, addressed to the *Scientific American*, and published in the Number dated October 5th, is the following:—

"I have the pleasure of stating that I have succeeded in making certain bodies repellent or repulsive to water, when immersed in

it. For instance—the whole surface of a vessel's bottom and sides (of a peculiar form), from the stern-post to the broadest cross-section, has, by a peculiar electrical state, a repulsive action upon the fluid which buoys it up, and consequently the vessel has an onward motion so long as this electrical action continues. This electrical action is furnished and continued by magneto-electricity, and if the vessel's course is in a circle, her motion will be perpetual."

Truly we live in a marvellous age, when it is safe neither to believe nor doubt. Time is, however, a patient resolver of all difficulties, and to his wisdom we must leave the solution of our perplexities on the application of electricity as a motive power.

ELECTRO-CHEMICAL TELEGRAPH.

An American patent has recently been obtained by Messrs. Westbrook and Rogers for the above object, the nature of which will be understood by the following extracts from the patentees' specification:—

"This invention consists in recording telegraphic signs on a metallic surface, connected with the earth by a wire conductor at one end, and to a galvanic battery and the earth at the other end of the circuit, by the use of acidulated water, or other fluid, interposed between the point of the usual wire conductor leading from the operating apparatus, connected with a galvanic battery, of the ordinary construction, and the metallic surface; by which the use of paper is dispensed with; time also is saved in not having to moisten the chemically-prepared paper when it becomes too dry for use, and in having the telegraphic signs more clear and distinct on the metallic surface than on the paper; the inconvenience arising from the fumes from the chemicals employed in preparing the paper, also the evils arising from the corrosion of instruments, and annoyance to the operators in preparing and using chemical paper, are likewise avoded."

"*Claim.*—What we claim is, recording telegraphic signs on the surface of a revolving metallic cylinder-plate, or other equivalent surface, by means of an acidulated liquid or saline solution, or water, held between the point of the wire conductor and the metallic recording surface, by means of a non-conducting porous substance contained in a glass, or other non-conducting reservoir, in which the recording fluid is contained; to which the electric current from a battery is applied by means of any of the known forms of manipulators and anvils used for making and breaking the circuit,—the recording fluid being applied to the metallic recording surface substantially in the manner herein fully set forth, by which the use of every description of paper is dispensed with; thereby saving great expense in telegraphing."

AN ACCOUNT OF THE EMERY OF ASIA-MINOR, AND THE MINERALS GEOLOGICALLY ASSOCIATED WITH IT.

BY M. J. L. SMITH.

(Second Article.)

[Translated for the London Journal of Arts and Sciences.]

THIS part of the subject relates particularly to the minerals which are found associated with emery in the districts already mentioned in the first portion of the memoir. It was there shewn that emery is a substance met with in considerable abundance in certain parts of the world, constituting a mineral of the first order, and deserving a place in the category of rocks. It will be further useful to give some account of the mineral products which are found associated with it, and of some novel circumstances which I have observed. In the first place I shall mention corindon; although emery is composed in great part of corindon, the examination of the latter substance in a state of purity (in the crystalline form, in which I have often found it when in contact with emery) has brought to light some circumstances which, in dealing with a substance of so composite a character as emery, it would have been impossible to learn. The most remarkable of the circumstances which the analysis of corindon has brought to our knowledge is, that it contains, according to its variety, water, in variable quantities: this is the case with all kinds of corindon, excepting the sapphire and ruby. I consider the presence of water in combination, in corindon, to be a circumstance of considerable importance, inasmuch as it proves that harmophanous corindon, and hyaline corindon (adamantine and telesian spar) are formed under different conditions. I may remark here, that in the examinations I have made of different specimens of emery, the most careful research has failed to shew the presence of hyaline corindon in any one instance.

Diaspore.—This is a mineral which, up to the present moment, has not much occupied the attention of mineralogists, and which has only been found in two or three localities: I hope, however, to be able to prove that diaspore plays an important part in relation to formations of emery and corindon. Before my attention was drawn to the examination of diaspore (which was discovered by M. Le Lievre), it had been analyzed by M. Dufrenoy and M. Haidinger; and the districts in which it had been found were, Gumuch-dagh and Manser in Asia-Minor, and the islands of Naxos, Samos, and Nicoria, in the Greek Archipelago. I have found that diaspore is almost always mixed with corindon; indeed this appears to be so invariably the case, that where it has not been found thus associated, it is, I believe, only because it has not been sought with sufficient care. In some crystals of corindon which have been obtained from China, I have already succeeded in discovering diaspore.

Emerilite,—a new species of mica, is another of the mineral substances found in deposits of emery. I have given to this the

name of emerilite, and it appears to belong to the mica family. I first discovered this mineral in the emery of Gumuch-dagh in Asia-Minor, and afterwards in that of Naxos, Nicoria, and Manser. Its presence in all the varieties of emery I have examined, excepting that of Kulah, has induced me to call it emerilite. When I first made known this discovery, Professor Silliman entered upon an examination of the different minerals found in the corindon districts of the United States: he has never failed to find in them evidences of the presence of emerilite. Since I have returned to Paris, I have discovered emerilite in a specimen of the emery of Siberia; and I have reason to believe that it is likewise present in the corindon of China; but as I have not yet analyzed this, I cannot be certain upon the point. Up to the present time, emerilite has only been found associated with emery, or what is the same thing, with corindon: in these it is often contained in the centre of the mass, but most frequently at the surface.

Ephesite is another new mineral;—it has a compact lamellar structure, and is pearly-white in hue; it scratches glass with great ease, but differs from the last-described substance in composition, as it contains a larger proportion of alumina, and less of the bases of protoxides:—it has been found in the emery of Gumuch.

Chlorotoid.—The variety of this substance, which I have found in the emery of Gumuch-dagh, has not the same composition as most of the minerals of this class, such as the chlorospar of the Oural, the massonite of America, or the sismondine of St. Marcel: chlorotoid resembles the latter most of the three. The other mineral substances which I have found most associated with emery are—hydrogilite, zinciferous spinel, pholerite (or rather a hydrated silicate of alumina, identical in composition with the pholerite of Guillemin), mica, black tourmaline, chlorite (identical with that of Mont des Sept Lacs), protoxide of iron, oligistic oxide of iron, hydrate of oxide of iron, iron pyrites, rutile, ilmenite, and titaniferous iron. There are, besides these, some two or three others; but as yet these species have not been established, on account of the difficulty in obtaining sufficient of the substance in a pure state to submit it to analysis.

In conclusion of this description of emery and the substances by which it is accompanied, I think I may venture to say that the hydrates of alumina, as diaspore; the silicates, as emerilite, chlorotoid, and tourmaline; and the minerals of iron, as magnetic iron ore and titaniferous iron,—are almost always found whenever corindon is present.—[*Comptes Rendus.*]

ON THE ACTION OF BASES UPON CERTAIN SALTS, PARTICULARLY UPON THE ARSENITES.

BY M. ALVARO REYNOSO.

It is generally admitted that when the solution of a salt, whose oxide is insoluble in water, is mixed with an alkaline solution, the oxide is precipitated and not redissolved, at least, not unless it be

soluble in an excess of the alkali used as the precipitant. In studying the action of potash or soda on the arsenites, the author has been led to observe some circumstances which, if not exactly contrary to the general rule above stated, prove, at least, that the phenomenon of precipitation depends very much upon the nature of the soluble salt remaining in the fluid; and that in certain cases the nature of that salt itself may determine the insolubility of the oxide. For example,—as the oxides of copper, uranium, cobalt, nickel, silver, mercury, and peroxide of iron, are insoluble in potash and soda, when a solution of either of those alkalies is mixed with the arsenites of the above bases, there ought to be produced, theoretically, a precipitation of the metallic oxide, and formation of an arsenite of potash or soda, as the case may be; and the excess of alkali ought not to produce any effect upon the precipitated oxide. It has, however, been found that, practically, the arsenites of all the bases mentioned are soluble in potash, although the oxides uncombined are quite insoluble in that alkali. The arsenite of iron is very soluble in potash.

The solution of arsenite of copper is blue; but after a certain time it decomposes spontaneously,—protoxide of copper being precipitated, and the arsenite of potash being converted into arseniate.

The decomposition of the arsenite of mercury, in solution, is almost instantaneous; but the solution of arsenite of silver, which is colorless, decomposes very slowly,—precipitating the silver in the form of a black powder: this solution is not precipitated by chloride of sodium; on the contrary, the chloride of silver, which is insoluble in potash, is readily dissolved, as soon as some arsenite of potash is added to it.

Advantage was taken of these two properties of arsenite of silver to effect the reduction of the salts of palladium by means of silver: the experiment was made in the following manner:—Into a solution of arsenite of silver in potash, is poured choride of palladium, to which arsenite of potash had been previously added. A black powder will be immediately precipitated, which consists of metallic silver and palladium. Chloride of platinum is reduced even more rapidly than that of palladium; and, in these actions, it must be remarked, that the arsenite of silver is decomposed much more quickly than when it is alone. The arsenites of cobalt, nickel, and uranium, do not completely dissolve in potash or soda, excepting when nascent:—to effect the solution, arsenite of potash, with a large excess of potash, must be mixed with the soluble salt of cobalt, nickel, or uranium.

The nature of these actions may be easily understood, if it be admitted that arsenite of potash can form, with the combination of potash with the above oxides, a soluble double salt, and that it is under such an influence that the solution of the oxide is determined. When potash is added to an insoluble salt of an oxide soluble in excess of potash, solution of the oxide can only take

place under the formation of a soluble double salt:—thus the author has ascertained that arsenite of lead is insoluble in potash. The proof that the reaction depends upon the nature of the salt formed is, that arsenite of lead, which is insoluble in potash, is completely soluble in soda. When potash is added to an insoluble salt, it first withdraws the acid from the base; and the latter being set free, remains without action on the salt formed by the reaction, because it is insoluble; but, if on adding an excess of potash, the oxide is soluble in that re-agent, and if the combination of the oxide with the potash cannot combine with the salt resting in the supernatant fluid, there will be two soluble salts formed, which being able, by their mutual decomposition, to form an insoluble salt, the original salts will be reproduced. This is, however, a rare case; for experience has shewn that almost all the salts of potash possess the property of forming double salts with the oxides which are themselves soluble in potash. There may be four different cases of the action of excess of potash on insoluble salts.

1st. Certain oxides soluble in a free state in potash, and forming soluble double salts with all the salts of potash; the solution taking place under all circumstances.

2nd. Oxides soluble in potash in a free state, but forming salts insoluble in potash, when the acid is not of a nature to form a double salt with the combination of the oxide and potash.

3rd. Oxides insoluble in potash in their free state can, nevertheless, sometimes form a soluble double salt, and consequently dissolve when brought in contact with potash in their nascent state, in the presence of a salt of potash with which they may combine.

4th. When the oxide is insoluble in the alkalies, it is precipitated, and not re-dissolved when treated with an excess of the alkaline base; this case occurs when the precipitated oxide is incapable of forming a double salt.

ON THE TRANSMISSION OF HEAT.

BY MM. MASSON AND JAMIN.

MOST persons, connected with scientific pursuits, are acquainted with the remarkable experiments, by means of which Mr. Melloni has demonstrated, that caloric is composed of rays; possessing different and especial properties, corresponding to those which distinguish the different colored rays of light; and that all bodies possess, in relation to these rays of heat, a true coloration, which, although it is insensible to the eye, may be revealed by the nature and proportion of the rays which are transmitted. To establish these facts, M. Melloni has employed data arbitrarily chosen.

The different rays have each a different individual action; so that the effect produced is the sum of those elementary actions which we should observe if each simple ray could be separately studied; and it is extremely difficult to deduce from the united

action of all the rays, the nature of the elementary actions which together make up the compound result. This method may be applied with success in the observation of phenomena which have a common direction and intensity, such as the vibration of the rays; but it becomes questionable when applied to any action in which the diversity of the rays leads to uniform results. It has proved, for example, the polarization of light and the law of Malus; but it cannot demonstrate the planes of polarization of the polarized rays which have traversed a plate of quartz, because they are different; nor can it analyze the phenomena of thin plates, on account of the dispersion which they produce. M. Melloni, taught by his early experiments, endeavoured to analyze the heat emitted by the sun, and found it associated with light in the solar spectrum. He ascertained that there existed calorific vibrations, which were obscure or invisible, and less refrangible than the red ray, and others accompanying the light; going then to the study of the transmission of the different rays of heat through glass and water, he discovered that those substances were capable of stopping or destroying the invisible rays,—but that they permitted a large proportion of the luminous calorific rays to pass through them; while blackened bodies, similar to black glass, stopped the whole of the luminous rays of heat and transmitted those which are invisible. This method of investigation, long since applied successfully in the study of light, introduced to the examination of the phenomena of heat a remarkable degree of simplicity, as it shewed the refrangibility belonging to the rays of caloric, which are transmitted or otherwise by certain bodies; and not only proved that they have different thermo-colorations, but indicated the rays to which they applied.

M. Melloni has not, however, continued to follow this system; and in a work recently published, which contains an account of the whole of his discoveries, he has given all the arguments and deductions to which he has been led by his first method of investigation. In arriving at a conclusion, it seems, however, more simple to isolate each homogeneous color, and study its action; and it appears useful, likewise, to repeat all the experiments, in order to obtain evidence in favor of either one or the other of the theories of heat. One of these, which was long admitted to be the true theory of heat, and which M. Melloni adopted in his earlier works, supposed heat and light to be the effect of different causes; and M. Melloni, who had discovered the existence of heating rays without light, believed that he had produced light without heat, by passing through layers of water and green glass the rays of the sun concentrated by a lens, which, although, to use his own words, becoming as bright as the sun, could not produce the least calorific effect on the most delicate instrument. After the discovery of the polarization of heat, however, and his researches of 1844, M. Melloni came to an entirely different opi-

nion, which he published in his "Thermocrôse," supporting it by reasons, to which the only argument that could be opposed must be drawn from his own previous experiments. If it be true, as Ampère was the first to suppose, that heat and light are produced by one cause, it is evident that the two effects ought always to bear a certain proportional relation to each other, whenever a single vibration of light and heat is submitted to experiment. So, if it were found that the proportions of light and heat in a ray, transmitted through a body, were not equal, the hypothesis which supposes the identity of cause, ought to be abandoned. Now, the former positive assertions of M. Melloni, and indeed some made at a late period, leave considerable doubt on the mind of his readers. He caused a solar spectrum to be transmitted through glass, colored blue by cobalt: the spectrum was divided into alternate bright and dark bands; and he announced that the calorific spectrum did not present any analogous phenomenon. Recurring to the same subject in his Thermochrôse, he repeats this assertion, and states, that the proportions of heat and light which traverse colored glasses, are not in constant proportion to each other. He sought to refer this circumstance to some action of the eye,—considering the cause to be rather physiological than physical. On the other hand, the numbers in his work of 1844, shew that glass and water are traversed by a large proportion of luminous heat, without positively proving that the transmission of heat is equally absolute with that of light. On the contrary, they shew that a thickness of 14 millimetres of water only permits $\frac{13}{22}$ of red heat to pass; while it transmitted more than that proportion of light.

Wishing to again take up these investigations, we, with the assistance of M. Ruhmkorf, an artist of equal merit and modesty, prepared a spectrum, with the most minute precautions, and caused rays of a given refrangibility to pass successively through certain transparent substances; choosing those which are most unequally diathermanous, such as rock-salt, rock-crystal, alum, glass, and water. These transmit equally and entirely all the rays of heat comprised between the red and violet extremities of the spectrum.

We have particularly given attention to the red portion of the spectrum; and it appears that, contrary to the views of M. Melloni, the extinction of heat at this point amounts to nothing. Wishing to be able to determine this important point,—the thickness of the screens was increased; and it was discovered that, in the proportion as the transparency to light was complete, the calorific transparency remained absolute. We have corroborated this kind of proof, by causing the luminous rays of heat (particularly those corresponding to the red ray) to pass through a tube of water 80 centimetres in length: this absorbed a very sensible quantity of the light, and transmitted 75 per cent. of the heat. The mean-colored rays have given equally distinct results. Some sub-

stances, such as red glass, certain tints of green glass, and solution of sulphate or bichromate of copper in ammonia, are only capable of transmitting one color; and they permit only the corresponding ray of heat to pass; absorbing all the rest. Other transparent substances only transmit certain colors, separated by others, which they absorb. Chloride of chromium is transparent only for the red and green;—violet glass only allows red and violet to pass; and the absorption or transmission of calorific rays invariably follows the same law.

The action of glass, colored blue by cobalt, offered points of still greater interest. Firstly,—because it was first employed by M. Melloni in his experiments; and, secondly, because it separated the solar spectrum into alternate bright and obscure bands. We have discovered that it produces similar bands in respect to the rays of heat. We have likewise been able to measure the relation of the rays of transmitted light and heat to each other. An immoveable screen, pierced with a narrow slit, permitted a portion of the spectrum to fall upon a small apparatus, which, placed in the tract of the pencil of rays, indicated the quantity of heat transmitted:—this being removed, the same pencil was permitted to fall upon an instrument contrived to indicate the intensity of light. This double measure, repeated in numerous cases, has proved that the proportion of transmitted light and heat bears always an identical relation to the direct quantities. When a ray of homogeneous light traverses different thicknesses of the same substance, its intensity, when it emerges, may be represented by the formula $I = M^e$:—this ought to apply equally to heat. Our experiments, made on three plates of yellow glass, of thickness 1, 2, and 3, have proved this law to be correct,—M having the same value. If the incident light be composed of several colors, unequally transmissible, the intensity of the emerging pencil will be represented by the formula

$$I = M^e + M'^e + M''^e.$$

The light would also be altered in its composition, and would follow a certain law of absorption; which experiment has not yet demonstrated. This is the result of the calorific experiments of M. Melloni.

To the above experiments we have added some others of a different description and greater delicacy, with the object of demonstrating that the velocity and length of the wave are similar in light and heat of equal refrangibility. We have polarized light as it issued from the prism;—we have caused it to pass through different thicknesses of quartz, and through saccharine solutions; and we have always seen the plane of polarization of both heat and light turned in the same direction, and to the same extent. Three thin plates of $\frac{1}{4}$, $\frac{1}{2}$, and 1, the length of the wave, presented the same interference, both for light and heat: the first thickness produced circular polarization; the second, recti-

linear polarization in a plane deviating 90°; the third left the polarized emerging ray in the same state as the incidental ray.

From these experiments it may perhaps be concluded, that in the phenomena produced by a radiation of light and heat, in which both kinds of rays have a similar refrangibility, the relative quantity of light and heat, after and before the action, are identical. All the modifications of vibration, ascertained in the case of light, are found to relate equally and with the same intensity and numerical value to heat. Is not this constant relation of effects sufficient to prove identity of cause?

ON THE REPRODUCTION OF LEAD FROM THE SULPHATE OF THAT METAL.

BY PROFESSOR SCHNEDERMANN.

It is well known that, for printing and dyeing purposes, several acetates are employed, and, amongst others, the acetate of alumina. These are prepared by treating the bases with acetate of lead, and precipitating a sulphate of that metal. A considerable quantity of sulphate of lead is thus obtained as a secondary product; and, although this salt may be employed in some branches of industry, such as the manufacture of ceruse, pottery, &c., yet the manufacturers are enabled to get rid of but a small portion in this way as compared with the quantity produced, and that at a very low price. Independently of this, it is only pure sulphate of lead that can be made available for the above purposes, and not the impure sulphate, prepared from acetates of lead, mixed with pyrogeneous matters, and which constantly retain a portion of those matters, and are, consequently, uniformly of a brown color.

It appeared, therefore, desirable to discover a practical and economical process for reproducing the lead in a metallic state from this product; and, after many experiments, M. Schnedermann found out the following:—The sulphate of lead is intimately mixed with carbonate of lime, charcoal, and fluor-spar, and this mixture is raised to a white heat. Sulphate of lime and carbonate of lead are thus produced; which latter may be reduced into metallic lead by charcoal. As sulphate of lime does not fuse at the temperature employed, the lead would not run into a lump, but would be disseminated through the mass of gypsum, if fluor-spar were not, at the same time, added. This body, as is well known, possesses the property of entering into fusion with sulphate of lime at a high temperature, probably by the formation of a double salt more fusible; and this property is exercised here, to form, with the sulphate of lime, a slag which melts with facility. The most advantageous proportions are—8 parts of sulphate of lead (dried in the air), $5\frac{1}{3}$ parts of carbonate of lime (chalk), 1 to $1\frac{1}{4}$ parts of charcoal, and 3 parts of fluor-spar. On heating a mixture of these proportions during an hour in a Hessian

crucible, placed in a blast furnace, having a good draft, M. Schnedermann states, that he obtained, at the bottom of the crucible, a lump of metallic lead, perfectly soft, and free from sulphur. In the slag above, which was somewhat porous, some few isolated grains of lead might still be observed. These grains, having been collected by pulverizing and washing the scoria, and added to the lump, a very satisfactory product was obtained, consisting of nearly the whole of the lead contained in the sulphate. This process, when worked on a large scale, would perhaps be advantageously performed in a reverberatory furnace.

PREPARATION OF SPONGY METALLIC LEAD, AND ITS APPLICATION TO GALVANO-PLASTICS.

BY PROFESSOR BOLLEY.

SOME years since MM. Trommsdorf and Herrman, of Erfurt, took a patent in Bavaria, for a process for reproducing, by means of a solution of marine salt and zinc, the metallic lead contained in sulphate of lead, which is frequently obtained as a secondary product in certain branches of industry, and cannot be made use of. Seeing, however, that the inventors had neglected to consider this process relatively to some scientific points, and also to some applications of which it is susceptible, M. Bolley endeavoured to supply the deficiency, as respects their silence on the scientific points, by a memoir, which he published in a work called *l'Annuaire de Pharmacie Pratique;* and, with regard to the application of the process, he now furnishes some particulars.

The following is the method which he adopts for preparing sheets of lead:—He coats, as uniformly as possible, and to a thickness of from 2 to 3 centimetres, an even plate of zinc, with a thick paste of sulphate of lead ground with water. This plate of zinc is laid upon a dish, filled with a (not quite saturated) solution of marine salt, in such manner that the plate may only dip in the upper portion of the solution, but yet sufficiently deep to be entirely covered thereby. Upon this paste of sulphate of lead is ordinarily laid another thin sheet of zinc. By operating in this manner it would appear that the operation is most effectually accelerated, and that the salts formed, instead of remaining in the lead, fall to the bottom of the solution. At the expiration of three days (which period is, however, sometimes extended to eight or ten) the mass, which is from 2 to 3 centimetres in thickness, is completely transformed into metallic lead. This mass, still saturated with the solution of marine salt, and lying upon the plate of zinc, is now placed in a vessel full of hot water in order to extract the salts, and the lead which remains constitutes a soft coherent mass, capable of receiving a permanent impression, even from the finger, and presenting metallic lustre when but lightly rubbed with a hard polished body.

On being submitted to the action of a powerful press, this mass is transformed into a solid sheet of elastic lead; or it may be made to take any desired form with the greatest nicety, on being compressed into moulds or on to models.

This latter property led M. Bolley to make some experiments with the view of applying this substance to galvanoplastics. He obtained from it, by means of pressure, copies of seals, coins, &c.; and these answered perfectly well the purpose of matrices for galvanic precipitation, after being gilt or silvered; but whether from want of time or patience, or of a sufficiently powerful press, M. Bolley could not succeed in obtaining good deposits of copper upon the leaden moulds. The reason of this is, that the copper enters the pores of the lead, and it is only by applying very powerful pressure to the lead, or perhaps by coating it with silver, and thereby stopping up the pores, that the infiltration of the copper could be entirely prevented. From the same cause, when it is required to remove the metallic deposits, the leaden model is always sacrificed, as there will always remain adherent particles of copper, which can only be removed by acetic acid.

M. Bolley states his belief, that a person skilled in galvanoplastics would soon succeed in removing the above obstacles:—the lead which he reproduced possessed such a remarkable degree of plasticity, that he does not doubt it will be found applicable to many useful purposes.

This spongy lead possesses another peculiarity:—M. Trommsdorff had already stated, that the lead which he obtained was, by reason of its facile oxidation, very suitable for the production of the acetate of that metal, and also for ceruse; as in the presence of a small quantity of acetate of lead, and in an atmosphere rich in carbonic acid, it was quickly transformed into carbonate of lead. M. Bolley says he has frequently remarked, that the residuum of spongy lead, which had not been submitted to pressure, when left in a damp state, shortly became almost entirely white throughout; which circumstance was solely owing to the formation of a hydrate of oxide of lead, and of the carbonate of that base.

The following phenomenon attending oxidation is however still more remarkable. Whilst the plates of lead, which had received a suitable and powerful pressure, remained without alteration, M. Bolley remarked, that all those which had not been submitted to such pressure, gradually lost all their elasticity or ductility, and became friable,—breaking with a dull fracture. Some few amongst them, presenting these phenomena, became, at the same time, clouded (*qy.* covered with oxide). On one occasion, on rubbing a moulded piece over lightly with oil, a rag was used, and then thrown aside;—on taking the rag up again, at the expiration of ten minutes, it had become so hot that it could scarcely be held. M. Bolley only noticed this phenomenon once afterwards, and with much less development of heat. Many experi-

ments, to endeavour to re-obtain this effect, entirely failed. M. Bolley imagines this phenomenon to have arisen solely from the slow spontaneous combustion of the sub-oxide. He is also of opinion, that the black body, obtained by heating oxalate of lead, is a sub-oxide. This substance may be ground in a mortar,—does not form an amalgam with mercury; and, when heated in a glass tube, is converted into metallic lead and a yellow oxide.

The metallic lead, obtained in the form above described, would certainly seem to merit the attention of chemists and manufacturers,—as well from the new facts which it furnishes respecting the plasticity of metals, as from the circumstance of the combustibility of lead (which had not been hitherto remarked), and its total transformation into a sub-oxide.—[*Technologiste.*]

SAW-MILL DRIVEN BY ARTESIAN WELLS.

At Millwood (says an American paper) Dr. Withers has a saw-mill which is driven by water supplied from six artesian wells, situated on the premises, at distances from the mill varying from some 50 to 200 yards, ranging in depth from 300 to nearly 600 feet, and affording nearly 1000 gallons per minute. The water flows from all the wells to a common reservoir, and is conveyed thence to the mill by an aqueduct under ground, and is received into a box or reservoir, whence it falls on a reaction-wheel 40 feet below, and thus puts the mill in motion. After acting on this wheel, the water is conveyed to the river by means of a tunnel, cut through a limestone rock 240 feet in length, and, at the highest point, upwards of 50 feet in depth. The tunnel is 5 feet 8 inches deep by 4 wide.

As the water is nowhere visible under the mill, and empties into the river at a point not seen from the mill, some 50 odd feet below the top of the bluff, the mill, when in motion, presents to the superficial observer the appearance of a self-acting piece of machinery.

ON THE RELATION OF THE LAWS OF MECHANICS TO PERPETUAL MOTION.

By Jeremiah Day, late President of Yale College.

[*Communicated to Silliman's American Journal, by the Author.*]

I cannot engage to furnish any infallible remedy for the mortifying disappointments which abound in this fascinating field of investigation; yet it may not be altogether a waste of time to pay some little attention to a subject which has levied such heavy contributions on the inventive faculties of modern mechanicians and philosophers. The hints which I propose to suggest will be principally on the nature of perpetual motion, the benefits to be

expected from it, the difficulties to be encountered by the inventors, and the methods by which we may form an opinion whether it has been actually attained.

Perpetual motion is a motion continued without ceasing, and without any renewed application of force. A machine may be said to possess a principle of perpetual motion if it continues to move as long as it is kept in repair, and if it requires no new force to be applied to it from without. It is no part of the requisition concerning perpetual motion that the machinery should never be out of repair. If it goes when it is in order, that is all that is demanded. What is looked for is, not perfection in the construction of the apparatus, but an unfailing moving force. On the other hand, it is required that this force belong to the machine itself,—that it be not an application from without. A stream of water may run continually,—it may be applied to turn the wheel of a mill;—it may in this way become a never failing moving force. If the mill could be kept always in repair, the stream might be sufficient to turn it as long as the world stands. But this is not what is meant by the perpetual motion of a machine, as the expression is commonly used. The moving force is here no part of the mill; it is applied from without. What is wanted is, a principle of motion within the machine itself, or at least so connected with it as to accompany it wherever it may be removed.

It is further expected that the moving force should require no new supply of materials to keep it in action. In the steam-engine the moving force is within the machine; and its agency may be continued without interruption; but a constant supply of fuel is necessary to keep it in operation; and there is a continual demand for labor to furnish the fuel. To save this expense of materials and labor is the very purpose for which perpetual motion is wanted.

It is this which renders the proposed invention so highly important. Extravagant as the expectations of many ardent inventors may appear, there is reason to believe that, in this case, they would be more than realized, if the long sought for principle could once be laid hold of and brought into general operation. It would be of no great use, perhaps, to produce an instrument which would merely go,—a wheel, for instance, which would revolve continually without having force enough to result in any valuable product. A saw-mill which would run of itself would be an object of curiosity; but would be of very little practical use if the saw merely played up and down without cutting the timber. The force which is necessary to put a machine in motion is generally much less than that which is requisite to accomplish the object for which the machine is constructed; but there is reason to believe that, if a perpetual moving force could once be discovered, it might be increased to any desirable extent—that, if a power could be found which would continually over-

balance the resistance of the air and the friction of the parts of the apparatus, it might be so multiplied as to produce any of the effects for which force is required in the arts. If, for instance, the moving principle were a weight, and ten pounds could be so applied as to preserve an uninterrupted motion of the machine, a hundred pounds would accomplish much more; as the weight might be easily enlarged to almost any extent whatever,—there would scarcely be any bounds to the effects to be produced. The vast expense now incurred in providing reservoirs of water, in producing steam, in procuring labor, &c., as moving forces, might be wholly dispensed with. In the various manufacturing establishments in this country, and in Europe, millions of dollars might be saved in a single year. The invention might be considered a mine of wealth, even to a nation. It would not, perhaps, necessarily follow that a power which would put in operation a standing machine, as a mill or manufacturing establishment, would be adapted to the progressive motion of a plough or a coach; but it would seem less difficult to make such an application of a moving force than to originate the force itself. If this additional improvement could be effected, our oxen and our draft horses might be relieved from their labors; our carriages would be seen rolling through the streets of themselves; and we should be brought near to the state of perfectibility predicted by Godwin, when a plough need only to be let loose into a field, to accomplish the work of tillage.

Mankind have not been insensible to the immense advantages to be derived from perpetual motion. There is, perhaps, no one subject on which the inventive faculties have more frequently been called into exercise. It is doubtful whether a single year or even a single week has passed, for centuries, in which it has not occupied the earnest attention of some one. Many are probably employed in the search who never disclose their attempts to the public. They have a double motive for keeping the secret; on the one hand, to secure to themselves the reward of their success; on the other, to conceal their disappointment, in case of a failure. Persons of very various descriptions and occupations have been engaged in the pursuit. The man of science and the illiterate mechanic have both eagerly contended for the prize, and generally with equal success.

It is natural to inquire what can be the cause which has produced such universal failure where the zeal for attaining the object has been so ardent and so long continued. What are the difficulties which, with so provoking a pertinacity, unceasingly throw themselves in the way of the sanguine inventor? It would be in vain to attempt to enumerate all the obstacles which a subject so fruitful in disappointments presents. They will vary according to the means which are used to effect the object, and according to the characters of the different projectors. The man of science will be liable to embarrassments of one kind,—the mere

mechanician to those of another. The chief impediments in the way of the man of science are certain general principles, denominated laws of nature: his ingenuity is exercised in endeavouring to evade these; but they obstinately meet him at every turn; and, in spite of all his windings, he finds himself brought back to the same ground from which he started.

Nothing but what is capable of producing motion can be the cause of perpetual motion. The moving forces which are commonly applied to machines are weights, springs, running water, steam, wind, and the strength of animals. Of these, water, wind, and animal strength, cannot produce what is commonly meant by perpetual motion, because they are not constituent parts of the machine. They are forces applied from without. But steam, springs, and weights may belong to the machine itself. Of these, the weight of a heavy body is that which is generally made use of to produce perpetual motion. A weight is a very simple moving force, and may be made very powerful. The only difficulty with respect to it is, that it produces its effect only by descending; and that when it reaches the ground, its operation ceases. If it could be made to descend and then ascend, with the same force, it might keep a machine in perpetual action.

The difficulty is not, as some seem to have supposed, that a weight can move a body in one direction only. It can produce motion in any direction; not indeed by mere pressure; but by the aid of some very simple apparatus: for instance, a cord passing over a pulley. Nothing is easier than to change the direction in which a given power is to act upon the object to be moved. A weight may make a body either ascend or descend, or move horizontally; but the real difficulty is, that the power will not move at all after it has reached the ground: its operation then ceases entirely. The great thing wanted is, not a change in the direction, but a continuance of the motion.

Neither does the obstacle to perpetual motion consist in the law, that matter is incapable of originating motion in itself, or of effecting any change in its own motions: the difficulty lies not in beginning the motion, but in rendering it perpetual. The labour and expense of merely putting a machine in operation would be of no account, if the movement would only continue. Now, the first law of motion, instead of obstructing the continuance of the action, is the very principle on which that continuance depends, unless there is a renewed application of external force. There is one known instance of actual perpetual motion—the revolution of the heavenly bodies: this is owing to the fact, that they are incapable of putting a stop to their own motion, and that there is nothing else to stop them. But if matter were endowed, like animals, with a principle of voluntary motion, it would be as easy for it to cease to move, at pleasure, as to begin to move: it would then be as difficult to produce perpetual motion in a machine as in a horse or an elephant.

Some of the principles which really stand in the way of the inventors of perpetual motion are the following:—

1. In every machine there is some loss of motion from friction and the resistance of the air, and commonly a much greater loss from the expenditure of force in producing the effect for which the machine is designed. When a certain momentum is given to a body, it will continue the same till there is some cause to vary it. A wheel suspended freely on an axis would revolve with a uniform velocity, if friction and the resistance of the air could be entirely removed: perpetual motion would then be a thing of course; but these obstructions it is impossible to avoid, and they necessarily occasion a continual loss of motion.

In addition to this, a machine, to answer any practical purpose, must not only go, but it must also be capable of a constant expenditure of force upon the effect to be produced. A slitting mill, for instance, must not only be kept in motion, but must furnish a continual supply of force to separate the iron. The loss of motion on this account is far greater than that occasioned by friction and the resistance of the air: both must be compensated by a renewal of force from some quarter or other. It is the aim of the inventor of perpetual motion so to arrange his apparatus, that this new supply shall be furnished from the machine itself—that it shall not be dependent on any application from without. But in attempting to accomplish this object, he finds himself under the necessity of encountering a second unaccommodating principle.

2. Every body which communicates motion to another loses an equal portion of its own motion;—in other words, action and reaction are equal. It follows from this, that no portion of matter can communicate to another portion a greater momentum than it possesses itself. If that part of a machine in which the moving force begins to act could produce in another part a motion greater than its own, we might obtain a multiplication of force; and in this way we might secure a surplus to supply the deficiency occasioned by friction, &c.; but after all the trials which have been made upon bodies in every conceivable variety of condition, they obstinately refuse to communicate what they do not themselves possess. On this fact is founded a third important principle.

3. No combination of machinery produces any real increase of force. This is the fact with respect to each of the instruments called mechanical powers, taken singly; and it is equally true, in whatever way they may be combined with each other. The use of all apparatus of this kind is not to create force, nor to increase it, but merely to apply it. It is true, indeed, that a mechanical power may be so contrived, that a small weight may raise a very great one; but it will raise it a very short distance only. If one is a thousand times as large as the other, the latter must descend

a thousand feet to raise the former one foot; so that the momentum of the large body is no greater than that of the smaller one: there is, therefore, no increase of force obtained.

One or two cautions are necessary, however, in estimating the velocities of the power and the weight. In the first place, the velocity is to be reckoned in that direction in which the moving force of the body acts: thus, if a body moves down an inclined plane, the moving force is gravitation, which acts towards the centre of the earth. The velocity, when we are calculating the equilibrium, must be estimated in this direction. In the second place, there must be brought into the account that part only of the power which is concerned in producing the effect. If a weight act obliquely on the arm of a lever, a part of its force will be lost;—this must be thrown out of the estimate.

With these qualifications, we shall find that, however complicated may be the apparatus, the power will be to the weight in equilibrio as the velocity of the weight to the velocity of the power. As their momenta are equal, there is no increase of force produced by the machinery. This is a proposition, however, which one who is in pursuit of perpetual motion cannot be brought fully to believe till he has learned it by mortifying experience. He expects, by some peculiar arrangement of his levers, and wheels, and inclined planes, to make it appear that this is only a theoretical maxim, intended to answer the purposes of speculative philosophy. He seeks after modes of combination which may vary as much as possible from those already in use, that he may fall upon the grand secret in some mysterious disposition of parts, which has hitherto escaped observation; but the effect of all this is commonly to diminish the power which he wishes to increase; for although, according to the received laws of mechanics, no combination of machinery will create force; yet it is very easy, by an unskilful arrangement, to destroy motion.

After all, the projector finds an unfailing source of motion in the weight of a heavy body. Though he may acknowledge, perhaps, that machinery will not of itself produce force; yet he considers that gravitation is a power which is perpetually operating, and that, if he can only arrange his apparatus so as to catch this force and apply it to his use, he has all that he wants. He here finds a very important exception to the general law—that a body is incapable of putting itself in motion. Matter has a continual and powerful tendency to move towards the earth. A body needs only to be left to itself to descend with a force proportioned to its weight. But he is driven even from this refuge by a fourth general principle.

4. A body, by its weight, communicates motion in no other way than by descending; and when it has once reached the earth, its operation ceases till it is raised up again with a force equal to that with which it descended. This does not mean that

a body can, in no case, communicate motion except by descending itself. A heavy body, moving in any direction, may impel another in the same direction. A cannon ball may drive before it the object which it strikes: this is not done, however, by the weight of the ball, but by the momentum which it has received from a foreign force. What we are now considering is the motion produced by the gravity of the body,—not that which is occasioned by the application of mechanical force from without. Neither does the principle just stated imply, that a body may not, by its weight, cause another body to move in any direction except towards the earth. The weight in one scale of a balance may cause those in the other side to rise; but to do this it must itself descend. Nor, in the third place, is it to be understood that a body cannot, by its weight, have an effect of any kind without descending; it may, even in a state of rest, have great influence in preventing motion; it may be a powerful resisting force; but it is not then a moving force. In preserving the equilibrium of bodies at rest, very great advantage may be derived from the application of the instruments called mechanical powers. By means of a lever or an inclined plane, one pound may be made to balance a thousand. Archimedes might have held a world in equilibrio; but the moment the lever is put in motion, the comparative importance of the smaller body is lost. What is gained in weight, is lost in velocity.

With these explanations, we may consider the principle as universal—that no body produces motion by its weight, except by descending. If, for instance, a heavy body is laid upon an inclined plane, this plane may move horizontally; but, unless the weight descends, the motion of the plane is owing to some other cause than the pressure of this weight.

Now the great difficulty in making the gravity of a body a source of perpetual motion is,—that the body must soon reach the ground; that in descending it acquires only a certain degree of momentum; that it can communicate no greater momentum to the machine; and that, in order to repeat the operation, there must be a force at least equal to this, to bring it back to the height from which it has descended. There is, therefore, no force at all derived from the weight, except during the period of a single descent, and that only equal to the power which has been applied to raise it up to the point of starting. It will be said, perhaps, that the weight may be made to restore itself—that it may acquire a velocity in falling sufficient to raise it to the same height again. So it may. The ball of a pendulum may raise itself to the same point from which it started, or nearly so; but it can do nothing more. The force acquired in the descent will be all expended in the ascent: there will be nothing left to be applied to any machinery.

There is no avoiding of this result, unless some way can be contrived to make the body either acquire a greater force by falling or expend less in rising. No method has yet been devised

to bring a body to the ground by its weight with a greater force than that which it acquires by falling perpendicularly: it may be made to roll down an inclined plane, to descend on the arc of a circle, on the arm of a lever, or along a series of lines differently inclined to the horizon; but in every such case, though it is easy to diminish the force of the descent, yet there is no way of increasing it but by the application of a foreign impulse. On the other hand, a body can by no device be raised up to its original height, but by a power equivalent to that which it acquires in descending. There is, according to the received laws of mechanics, no way in which it may be brought back again with a less expenditure of force than that which is necessary to raise it up perpendicularly. It may be carried round in such a manner as to employ a greater power; but nothing less than this will be sufficient to restore it.

But may not advantage be taken of some of the mechanical powers, to effect the object with more economy of force. Suppose the weight be made to descend on the longer arm of a lever, and to ascend on the shorter arm. If one be twice as long as the other, may not one pound raise nearly two pounds? It may; but it will raise them only half as far as it moves itself,—so that nothing is gained by this expedient. Such is the uniform result of the projector's devices to bring up his weight with a less force than that which it acquires in falling perpendicularly. Like the stone of Sisyphus, in spite of all his efforts, it is for ever rolling back upon him.

We shall be brought to the same conclusion by another view of the subject. No body of machinery has any tendency to move by its weight any longer than this motion will cause the centre of gravity to descend. This is a principle of very convenient application, because it brings us at once to the result. We are under no necessity of inquiring into the peculiar structure of the machine. Whatever be the arrangement of the parts, as soon as the centre of gravity of the whole has reached the lowest point, the motion will cease—except that it may continue awhile from the momentum already acquired.

We may, upon this principle, easily perceive the defect of those numerous perpendicular wheels which have been formed with cavities in the radii or other parts, so as to contain fluids or balls rolling alternately to and from the centre. The object here is to have the weights near the axis while they are ascending, and near the periphery when descending, so as to act upon the principle of the wheel and axis. The fallacy is the same here as in the longer and shorter arms of the lever; but to detect this, there is no necessity of examining the particular structure. Whatever be the disposition of the parts, when the centre of gravity of the wheel and its contents has reached the lowest point, the tendency to move, from the weight, is at an end. The defect of the contrivance is also evident from the consideration that, as the wheel revolves, each of the balls must rise to a certain height; and it is

immaterial by what route it arrives there, whether by going round on the periphery or taking a shorter course near the axis.

Similar difficulties will be presented if, instead of the weight of a solid body, we substitute the pressure of a fluid. According to what is called the hydrostatic paradox, a pound of water may balance and set in motion a quantity ever so great; but the motion will not, perhaps, be more than a thousandth part of an inch before the effect will cease.

After dwelling so long upon the weight, as a moving force, it will not be necessary to enter into a particular consideration of the action of springs. The difficulty in the two cases is nearly the same. A spring which is coiled up, as in a watch, produces its effect by expanding. When it is unbent, its action ceases, till it is wound up again; and to wind it up requires a force equal to that with which it expands. There is, therefore, no balance left for the purposes of machinery.

In the case of steam, the continuance of the motion is to be sought for, not upon mechanical, but upon chemical principles. Here perhaps there is more reason to hope, because the ground has not been so long and so thoroughly explored; but it is not improbable that the balance of affinities in chemistry will prove to be as untractable as the balance of momenta in mechanics. A similar remark may be applicable to the imponderable agents, electricity, galvanism, and magnetism.

Some of the difficulties which lie in the way of the man of science, in his pursuit after perpetual motion, have now been stated; but perhaps this is not the class of persons which are most likely to succeed in this field of investigation. The invention, if it should ever be made, may proceed from some one who has little or no knowledge of the laws of mechanics. The philosopher commences the inquiry with ardour; but soon stumbles upon one of his unyielding general principles; and then abandons the pursuit as hopeless. The uninformed mechanic is not so easily disheartened;—if he fails in one attempt, he sees no reason why he should not succeed in the next. Perseverance supplies the want of skill. His very blunders may turn to his advantage, by leading to combinations of machinery which a person of more scientific views would have rejected without trial. He however is not exempt from embarrassments; they are mostly of a nature not to be particularly described; but they all terminate in one—his machine won't go.

It must be acknowledged, however, that although this is the general result, it is not universal;—there is, here and there, a solitary exception. A man, after years of thought, and toil, and disappointment, finds at length the object of all his wishes attained. His machine goes; his labors are at an end; his fortune and his fame are secured; he has shewn himself superior to all the pretenders to science and mechanical skill; his name is to go down to posterity in the same rank with Bacon and Newton;

but in the intoxication of success one thing seems to have escaped him. He has forgotten that all motion is not perpetual motion.—His machine stops; his dream is ended; and he awakes to the realities of the life of a sober mechanic.

Must we then be driven to the conclusion that perpetual motion is absolutely and for ever impossible? Shall we obstinately close our eyes and ears against all proof which may be offered of its actual existence? Shall we reject the testimony of our senses when we see the machine really in motion? When a man professes to have made the great discovery, and calls upon us to accede to his pretensions, we have a right to suspend our opinion till he has made good his claim, either by shewing the principle on which it depends, or by furnishing the proof by actual trial.

If a new principle is advanced, in opposition to those hitherto received, we may safely admit it when it has stood the test of as thorough an investigation as they have. The established laws of mechanics have been the subject of strict examination for centuries; they have been turned in almost every conceivable point of view, for the very purpose of eliciting from them perpetual motion; they have been scrutinized by the profoundest mathematicians, and the most skilful experimenters; they have been put to the trial in a thousand different forms of machinery. Almost every mechanical instrument now in use exhibits experimental proof of its soundness. When any *new* principle can plead as much in its favor, it may fairly be put in competition with the old ones.

But the inventor, though he may not boast of theory on his side, has that which is of far greater importance—the support of fact. His machine goes;—so does a time-piece go;—it may be made to go for a whole year together without being wound up; but this is not perpetual motion. In a clock, a force is wanted to supply the loss from friction. If the instrument is nicely constructed, this loss may be very small: a large weight may furnish the requisite supply for a long time without coming to the ground; but when it has descended as far as it can, its power is exhausted, and the motion ceases. To determine from trial whether any particular machine has an unfailing principle of action, we must wait till the force first applied has had time to spend itself. If we are impatient to come to a more speedy decision, there is a way in which the point may be soon settled. The apparatus may be so well adjusted, that it may take weeks or months, perhaps, to exhaust the moving force in merely overcoming the friction. But let it be required to do something more. Instead of merely going, let it be applied to some practical purpose. Let it be employed, for instance, in the grinding of grain or the sawing of timber. In proportion as the resistance is increased, the time of its action will be shortened, if, like other machines, it is dependent on a renewed application of force from without. But if it possesses a perpetuating principle, this may

be made to supply that part of the loss of momentum which proceeds from the resistance of the grain or the timber, as well as that which is owing to friction and the air. In this manner, the instrument may be brought to the test of experiment in a very short time.

With respect to any supposed invention, in years past, of an instrument for perpetual motion, we have only to inquire, whether it is now in operation in our manufacturing establishments of every description;—whether our mills and forges, our steam-boats, and our railroad cars, are actually moved by it. An improvement which is to produce so complete a revolution in practical mechanics could not long be concealed or confined to the inventor;—it would be coveted and circulated as eagerly as a bank of guineas. A man professes to have discovered an inexhaustible treasure,—he has unfolded a secret which thousands have sought for in vain,—he has opened a mine of gold which is accessible to every one,—its value is beyond all computation,—and yet, strange to tell, it lies neglected and forgotten, neither wrought by himself nor by any one else.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1850.

Sep. 25. *William James Epps,* of the Bower Nurseries, Maidstone, Kent, for an improved sulphurator.

26. *George Boulton,* of 12, Great Dover-street, Borough, for an improved globular shield pin.

26. *William Cutler,* of 25, St. James's-street, London, for "the Duplexa coat."

26. *Joseph Morris & Sons,* of Astwood, near Redditch, for a needle case.

28. *Hurst & Reynolds,* of 100, New-street, Birmingham, stay manufacturer, for an improved fastening for stays and other articles of dress.

Oct. 1. *Thomas Thompson,* of Leith, Commander R. N., for a safety plug for boats and vessels.

1. *George Aldred,* of Primrose-street, Bishopsgate-street Without, London, for a plate mortice nut, for a looking-glass.

1. *Walter Raymond,* of 4, East Albion-square, Queen's-road, Dalston, Middlesex, master mariner, for a life raft.

2. *Frederic Clowes,* of 28, Anne-street, Birmingham, for a self-adjusting vertebral brace.

2. *Samuel Augustus Hayes,* of 182, Strand, for apparatus for fractures of the lower extremities.

Oct. 3. *Thomas Key,* of 20, Charing-cross, London, musical instrument maker, for "the new improved regimental cased clarinet."

4. *Clayton, Shuttleworth, & Co.,* of Stamp End Works, Lincoln, for a combined threshing, shaking, and riddling machine.

4. *Henry Kilbey & William Harris,* of Cheltenham, for a portable hot-house.

4. *John George Taylor,* of Great St. Thomas-the-Apostle, London, merchant, for a self-securing spring for pins, brooches, and ornaments.

4. *Allen & Moore,* of Birmingham, for a match-box lid.

4. *Mortiboy & Herbert,* of 8, Newman-street, Oxford-street, for a clasp-fastener for bracelets, chains, and other articles of jewellery and dress.

5. *John Cartwright,* of Newton-wood, in the county of Chester, boiler-maker, for an improved steam-boiler.

5. *George Harrow,* of 38, Old Bond-street, London, for an improved railway travelling-trunk,—"the Panelasticon."

7. *George Boulton,* of 12, Great Dover-street, Borough, for an improved safety pin.

8. *Roger Brown,* of Division-street, Sheffield, Yorkshire, for a magnetic lightning conductor.

8. *Elkington & Co.,* of Birmingham, for a fountain.

8. *W. Culverwell,* of 16, Charlotte-street, Blackfriars, for a portable domestic vapor bath.

8. *Fox, Henderson & Co.,* of London Works, Birmingham, and Spring-gardens, London, for a luffer for a ventilator.

8. *Miall, Marshall, & Co.,* of Ingram-court, Fenchurch-street, London, drain-pipe and fire-brick manufacturers, for a duplex flanged pipe-joint.

8. *William Chapman,* of Johnson-street, Clonmel, county of Tipperary, Ireland, for a grain-crusher and regulating feed, for facilitating the grinding of meal and flour.

9. *William Lowe,* of Birmingham, for a bolt.

10. *Louis Dutreilh,* of 4, Wellington-street, Strand, London, veterinary surgeon, &c., for the "plantoform," or instrument for measuring the feet of horses, for facilitating shoeing.

10. *Morris Gardiner,* of Ashill, near Watton, Norfolk, for a lever spring-drop.

11. *John Gray and Robert John Keen,* of Liverpool, in the county of Lancaster, nautical instrument makers, for the anti-vibration elastic compass disc.

12. *John Smith,* of Albert Works, Uxbridge, for a revolving sifter.

Oct. 14. *Thomas Smith Freeman*, of 48, Fenchurch-street, City of London, for a safety-pocket for waistcoats.

15. *Charles Beinhauer*, of Hamburg, general merchant, for Charles Beinhauer's economical registered stove.

15. *George Rolfe and William Stacey*, of Bradford, for a perforated ventilating valve-cover.

16. *John Nurse*, of 43, Crawford-street, Bryanston-square, Middlesex, coach-builder, for "the cabriolet or curricle Brougham," with self-acting step-piece.

16. *John Raphael Isaac*, of 62, Castle-street, Liverpool, for a cork or stopper.

17. *Gustavus Edward Beckers*, of the railway-station, Paddington, C. E., for a self-acting siding stop.

18. *Cook & Williams*, of Princes-street, Hanover-square, for a respirator stock or tie.

18. *Cook & Williams*, of Princes-street, Hanover-square, for a face and chest protector.

18. *Susan Walker*, of the Grove, Hersham, Surrey, for a patinette.

21. *William Towns, B.A.*, of St. John's College, Cambridge, for a spirit meter.

22. *John Scholl*, of 41, Berwick-street, Oxford-street, for a smoke consumer for gas-burners.

23. *George Mosley*, of 1, John's-place, Grange-road, Bermondsey, for a safety pin.

24. *F. B. Geithner*, of Birmingham, for an expanding dining table.

24. *William Poupard*, of 30, Wych-street, Strand, London, scale weighing machine and weighbridge manufacturer, for a curvilinear beam for weighing machines.

25. *Enoch Oldfield Tindall and Lorenzo Tindall*, carrying on business under the style or firm of *E. O. & L. Tindall*, in Scarborough, in the county of York, ironmongers and manufacturers, for "Tindall's smoke elevator."

25. *Key, Mitchell, & Friez*, of 103, Newgate-street, London, for a convertible bedstead.

25. *Edward Greaves*, of Sheffield, brass-founder, for a variable pendulum, or portable metronome.

26. *Bryan, Donkin, & Co.*, of The Engineers' Works, Grange-road, Bermondsey, for a rotary rag boiler for paper-makers.

26. *Walter Francis Robinson*, of the Junior United Service Club, Charles-street, St. James's, for a self-acting safety plug or stopper for boats and other vessels.

26. *Robert Watts*, of 35, Peter-street, Manchester, in the county of Lancaster, millwright and engineer, for improved metallic packing for pistons.

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th September to the* 17*th October,* 1850, *inclusive.*

To George Attwood, of Birmingham, in the county of Warwick, copper roller manufacturer, for a new or improved method of making tubing of copper or alloys of copper.—Sealed 18th September.

Peter William Barlow, of Blackheath, in the county of Kent, civil engineer, and William Henry Barlow, of Derby, civil engineer, for improvements in the permanent ways of railways.—Sealed 5th October.

Amedee François Remond, of Birmingham, for improvements in machinery for folding envelopes, and in the manufacture of envelopes.—Sealed 5th October.

William Benson Stones, of Golden-square, in the county of Middlesex, Manchester warehouseman, for improvements in treating peat and other carbonaceous and ligneous matters, so as to obtain products therefrom,—being a foreign communication.—Sealed 7th October.

William Cox, of Manchester, in the county of Lancaster, cigar merchant, for certain improvements in machinery or apparatus for manufacturing aerated waters or other such liquids,—being a foreign communication.—Sealed 16th October.

Edward Highton, of Clarence Villa, Regent's-park, in the county of Middlesex, engineer, for improvements in electric telegraphs, and in making telegraphic communications.—Sealed 17th October.

List of Patents

Granted for SCOTLAND, subsequent to September 22nd, 1850.

To Thomas Coats, of Ferguslie, Paisley, thread manufacturer, for certain improvements in turning, cutting, and shaping wood and other materials.—Sealed 23rd September.

William Benson Stones, of Golden-square, London, Manchester warehouseman, for improvements in treating peat and other carbonaceous and ligneous matters, so as to obtain products therefrom,—being a communication.—Sealed 23rd September.

Evan Leigh, of Miles Platting, near Manchester, cotton-spinner, for certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.—Sealed 25th September.

Jasper Wheeler Rogers, of Dublin, civil engineer, for certain improvements in the preparation of peat, and in the manufacture of the same into fuel and charcoal.—Sealed 30th September.

Jesse Bridgman, of London, for certain improvements in separating the fatty and oily from the membraneous portions of animal and vegetable substances.—Sealed 30th September.

Richard Prosser, of Birmingham, civil engineer, for improvements in machinery and apparatus for manufacturing metal tubes; which improvements in machinery are in part applicable for other purposes where pressure is required; also for improvements in the mode of applying metal tubes in steam-boilers or other vessels; and in the mode of clearing out the tubes of steam-boilers; and in the mode of feeding or supplying steam-boilers with water.—Sealed 1st October.

William Keates, of Liverpool, merchant, for improvements in machinery for manufacturing rollers and cylinders used for calico printing and other purposes.—Sealed 4th October.

James Young, of Manchester, manufacturing chemist, for certain improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom.—Sealed 7th October.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, London, mechanical draughtsman, for improvements in dyeing yarn, and in manufacturing woven fabrics,—being a communication.—Sealed 8th October.

William Tudor Mabley, of Manchester, patent agent, for certain improvements in the manufacture of soap,—being a communication.—Sealed 10th October.

Cuthbert Dinsdale, of Newcastle-upon-Tyne, dentist, for improvements in the manufacture of artificial palates and gums, and in the mode of setting or fixing natural and artificial teeth.—Sealed 11th October.

John Beattie, of Liverpool, engineer, for certain improvements in steering vessels.—Sealed 14th October.

John Grant, of Hyde-park-street, London, for improvements in heating and regulating temperature.—Sealed 14th October.

Etienne Joseph Hanon Valcke, of the Kingdom of Belgium, miller, for improvements in grinding.—Sealed 14th October.

John Mercer, of Oakenshaw, within Clayton-le-Moors, in the county of Lancaster, for improvements in the preparation of cotton and other fabrics, and fibrous materials.—Sealed 14th October.

William Erskine Cochrane, of Cambridge-terrace, Regent's-park, London, and Henry Francis, of Princes-street, Rotherhithe, for improvements in propelling, steering, and ballasting vessels; in the pistons of steam-engines; in fire-bars of furnaces; and and in sleepers of railways.—Sealed 14th October.

Alexander Dixon, of Abercorn Foundry, Paisley, for improvements in moulding iron and other metals.—Sealed 16th October.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture of candles and wicks.—Sealed 16th October.

Eugene Ablon, of Panton-street, Haymarket, London, for improvements in increasing the draught in chimneys of locomotive and other engines,—being a communication.—Sealed 16th October.

William Henry Green, of Basinghall-street, London, for improvements in the preparation of peat, and in the mode of converting and applying some of the products derived thereby to the preservation of substances which are subject to decay.—Sealed 16th October.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in manufacturing yarns,—being a communication.—Sealed 18th October.

Charles Bury, of Salford, manager, for certain improvements in machinery or apparatus for cleaning, spinning, doubling, and throwing raw silk.—Sealed 18th October.

John Percy, of Birmingham, Doctor of Medicine, and Henry Wiggin, of Birmingham, aforesaid, manufacturer, for a new metallic alloy or new metallic alloys.—Sealed 21st October.

New Patents
SEALED IN ENGLAND.
1850.

To James Hamilton, of London, engineer, for improvements in machinery for sawing, boring, and shaping wood. Sealed 28th September—6 months for inrolment.

Charles Harratt, of Royal Exchange-buildings, in the City of London, merchant, for improvements in rolling iron. Sealed 28th September—6 months for inrolment.

Joseph Burch, of Craig Works, in the county of Chester, printer, for improvements in printing terry and pile carpets, woollen, silk, and other materials. Sealed 28th September—6 months for inrolment.

Joseph Crossley, of Halifax, carpet manufacturer, George Collier, of the same place, mechanic, and James Hudson, of Littleborough, printer, for improvements in printing yarns for, and in weaving carpets and other fabrics. Sealed 28th September—6 months for inrolment.

Cyprien Theodore Tiffereau, of Paris, in the Republic of France, Gent., for certain improvements in hydraulic clocks. Sealed 3rd October—6 months for inrolment.

Jean Pierre Paul Amberger, of Paris, in the Republic of France, civil engineer, for certain improvements in the application of

magnetic power for moving and stopping carriages; for giving adherence to wheels upon rails; and also for transmitting motion. Sealed 3rd October—6 months for inrolment.

William Tudor Mabley, of Manchester, patent agent, for certain improvements in the manufacture of soap,—being a communication. Sealed 3rd October—6 months for inrolment.

William Boggett, of St. Martin's-lane, in the county of Middlesex, Gent., and William Smith, of Margaret-street, in the said county, engineer, for improvements in producing and applying heat; and in engines to be worked by steam or other elastic fluid;—which engines are also applicable as pumps. Sealed 3rd October—6 months for inrolment

Julian Bernard, of Buchanan-street, in the city of Glasgow, N. B., artist, for improvements in pneumatic springs, buffers, pumps, and stuffing-boxes. Sealed 4th October—6 months for inrolment.

Charles Bury, of Salford, in the county of Lancaster, manager, for certain improvements in machinery or apparatus for preparing and spinning, doubling, or twisting silk waste, cotton, wool, flax, or other fibrous substances. Sealed 10th October—6 months for inrolment.

Charles Bury, of Salford, in the county of Lancaster, manager, for certain improvements in machinery or apparatus for cleaning, spinning, doubling, and throwing raw silk. Sealed 10th October—6 months for inrolment.

Robert Beart, of Godmanchester, for improvements in the manufacture of bricks and tiles. Sealed 10th October—6 months for inrolment.

John Scott Russell, of Great George-street, Westminster, engineer, for improvements in the construction of ships or vessels propelled by paddle-wheels, with a view to better arming the same. Sealed 10th October—6 months for inrolment.

William Wood, of Over Darwin, Lancashire, carpet manufacturer, for improvements in the manufacture of carpets and other fabrics. Sealed 10th October—6 months for inrolment.

William Henry Ritchie, of Kennington, in the county of Surrey, Gent., for certain improvements in machinery for preparing and carding fibrous substances; being a communication. Sealed 10th October—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in manufacturing yarns,—being a communication. Sealed 10th October—6 months for inrolment.

James Hamilton Browne, of the Reform Club, Pall Mall, Esq., for improvements in the separation and disinfection of fecal matters, and in the apparatus employed therein,—being a communication. Sealed 10th October—6 months for inrolment.

William Francis Fernihough, of London, engineer, for improvements in locomotive and other steam-engines, and improve-

ments in obtaining motive power. Sealed 10th October—6 months for inrolment.

Whiting Hayden, of Windham, in the State of Connecticut, of the United States of America, for an improved regulator, or apparatus for regulating the draft of the sliver on the machine termed the drawing-frame. Sealed 10th October—6 months for inrolment.

Aldolf Frederick Gurlt, of Manchester, Gent., for an improved method of extracting silver from argentiferous minerals. Sealed 10th October—6 months for inrolment.

George Michiels, of London, Gent., for improvements in treating and preparing potatoes for seed,—being a communication. Sealed 17th October—6 months for inrolment

John Fowler, Jun., of Melksham, in the county of Wilts., engineer, for improvements in steam-engines; in raising and forcing fluids; in irrigating and draining land; and in machinery for cutting wood for drain pipes and other uses. Sealed 17th October—6 months for inrolment.

Daniel Towers Shears, of Bankside, in the county of Surrey, copper merchant, for improvements in the manufacture and refining of sugar,—being a communication. Sealed 17th October—6 months for inrolment.

John Robert Johnson, of Crawford-street, chemist, for improvements in fixing colors on fabrics made of cotton or other fibre; being a communication. Sealed 17th October—6 months for inrolment.

James Henry Baddeley, of Shelton, in the county of Stafford, engineer and designer, for improvements in the manufacture of ornamental articles of earthenware. Sealed 17th October—6 months for inrolment.

Thomas Richards Harding, of Lille, in the Republic of France, manufacturer, for improvements in machinery for heckling and carding flax; in machinery for combing and drawing wool and other fibrous materials; and in machinery for making parts of such machines; and for a new arrangement of the steam-engine for driving flax and woollen mills;—which arrangement is also applicable to other purposes where motive power is required. Sealed 17th October—6 months for inrolment.

Henry Bernoulli Barlow, of Manchester, consulting engineer, for improvements in spinning cotton and other fibrous materials,—being a communication. Sealed 17th October—6 months for inrolment.

James Henry Williams, of Birmingham, manufacturer, for certain improvements in the manufacture of buttons. Sealed 17th October—6 months for inrolment.

James Young, of Manchester, manufacturing chemist, for improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom. Sealed 17th October—6 months for inrolment.

Jean Louis Pascal, of Moorgate-street, in the City of London, civil engineer, for an improved apparatus for the cure or prevention of smoky chimnies; and also for the ventilation of ships, rooms, and buildings in general. Sealed 24th October—6 months for inrolment.

Thomas Beale Browne, of Hampen, near Andoversford, in the county of Gloucester, Gent., for improvements in weaving and preparing fibrous materials, and staining or printing fabrics; being a communication. Sealed 24th October—6 months for inrolment.

Alexander Dixon, of Abercorn Foundry, Paisley, for improvements in moulding iron and other metals. Sealed 24th October—6 months for inrolment.

John Mercer, of Oakenshaw, within Clayton-le-Moors, Lancashire, Gent., for improvements in the preparation of cotton and other fabrics and fibrous materials. Sealed 24th October—6 months for inrolment.

John Oliver York, of Boulogne-sur-Mer, France, for improvements in the mode or manner of generating steam in locomotive, marine, and other boilers. Sealed 24th October—6 months for inrolment.

John Grant, of Hyde Park-street, in the county of Middlesex, for improvements in heating and regulating temperature. Sealed 24th October—6 months for inrolment.

Aaron Rose, of Halesowen, in the county of Worcester, manufacturer, for a certain new or improved method, or certain new or improved methods of manufacturing twisted gun and pistol barrels. Sealed 24th October—6 months for inrolment.

Samuel Jacobs, of Highgate Kendale, in the county of Westmorland, cabinet-maker, for certain improvements in printing on woollen, cotton, paper, and other substances; parts of which improvements are applicable also to the purposes of coloring, shading, tinting, or varnishing such substances. Sealed 24th October—6 months for inrolment.

Bryan Millington, of Brant Broughton, in the county of Lincoln, and of the firm of Millington and Sons, of Newark-upon-Trent, in the county of Nottingham, millers, for improvements in corn-cleaning and flour-dressing machines. Sealed 24th October—6 months for inrolment.

Edward Clarence Shepard, of Parliament-street, Westminster, Gent., for certain improvements in electro-magnetic apparatus suitable for the production of motive power, of heat, and of light,—being a communication. Sealed 24th October—6 months for inrolment.

CELESTIAL PHENOMENA FOR NOVEMBER, 1850.

D.	H.	M.	
1			Clock after the ☉ 16m. 16s.
	—		☽ rises 3h. 11m. M.
	—		☽ passes mer. 9h. 39m. M.
	—		☽ sets 3h. 54m. A.
	7	52	♃ in conj. with the ☽ diff. of dec. 3. 27. S,
2	8	20	☿ in conj. with the ☽ diff. of dec. 3. 6. S.
4	2	1	♂ in conj. with the ☽ diff. of dec. 5. 16. S.
		40	Ecliptic conj. or ● new moon
5			Clock after the ☉ 16m. 15s.
	—		☽ rises 8h. 12m. M.
	—		☽ passes mer. 1h. 0m. A.
	—		☽ sets 5h. 40m. A.
	—		♂ in conj. with Juno, diff. of dec. 9. 4. N.
6	18	26	♃'s first sat. will im.
7			Occul. B.A.C. 6098, im. 6h. 29m. em. 6h. 45m.
	0	28	♀ in conj. with the ☽ diff. of dec. 8. 3. S.
8			Occul. 33 Sagittarii, im. 5h. 8m. em. 6h. 23m.
	—		Occul. *x*2 Sagittarii, im. 7h. 23m. em. 8h. 28m.
10			Clock after the ☉ 15m. 54s.
	—		☽ rises 0h. 46m. A.
	—		☽ passes mer. 5h. 9m. A.
	—		☽ sets 9h. 36m. A.
10	5	16	♀ at greatest brilliancy
11			Occul. *i* Capricorni, im. 3h. 2m. em. 4h. 19m.
	2	0	☽ in Apogee
	11	15	☽ in □ or first quarter.
12	3	36	Juno in conj. with the ☉
14	12	55	Pallas in □ with the ☉
	17	39	♃'s second sat. will im.
	18	7	♃'s third sat. will im.
15			Clock after the ☉ 15m. 14s.
	—		☽ rises 2h. 56m. A.
	—		☽ passes mer. 8h. 52m. A.
	—		☽ sets 1h. 51m. M.
	23	37	♄ in conj. with the ☽ diff. of dec. 2. 1. N.
16	20	51	♅ in conj. with the ☽ diff. of dec. 4. 39. N.
17			Vesta greatest hel. lat. N.
	—		Mercury R. A. 15h. 4m. dec. 16. 54. S.
	—		Venus R. A. 18h. 3m. dec. 27. 32. S.
17			Mars R. A. 15h. 44m. dec. 20. 2. S.
	—		Vesta, R. A., 13h. 42m. dec. 4. 17. S.
	—		Juno, R. A., 15h. 25m. dec. 9. 42. S.
	—		Pallas, R. A., 21h. 28m. dec. 5. 52. S.
	—		Ceres R. A. 0h. 2m. dec. 13. 34. S.
	—		Jupiter R. A. 12h. 53m. dec. 4. 30. S.
	—		Saturn R. A. 0h. 59m. dec. 2. 23. N.
	—		Georg. R. A. 1h. 42m. dec. 9. 59. N.
	—		Mercury passes mer. 23h. 22m.
	—		Venus passes mer. 2h. 18m.
	—		Mars passes mer. 23h. 58m.
	—		Jupiter passes mer. 21h. 6m.
	—		Saturn passes mer. 9h. 12m.
	—		Georg. passes mer. 9h. 56m.
19			Ceres stationary
	4	35	Ecliptic oppo. or ○ full moon
20			Clock after the ☉ 14m. 12s.
	—		☽ rises 5h. 11m. A.
	—		☽ passes mer. 0h. 6m. M.
	—		☽ sets 7h. 50m. M.
21			Occul. ϰ2 Orionis, im. 9h. 10m. em. 10h. 5m.
	—		Occul. 68 Orionis, im. 13h. 15m. em. 14h. 27m.
	2		☿ in the descending node
	4	8	☿ in conj. with Juno.
22	16	42	♃'s first sat will im.
	—		Occul. *d*1 Cancri, im. 17h. 41m. em. 18h. 42m.
	3		☽ in Perigee
25			Clock after the ☉ 12m. 50s.
	—		☽ rises 10h. 23m. A.
	—		☽ passes mer. 4h. 57m. M.
	—		☽ sets 0h. 35m. A.
25	13	42	♀ stationary
26	0	32	☽ in □ or last quarter
27			Occul. *b* Virginis, im. 13h. 16m em. 14h. 13m.
	22	51	☿ in sup. conj. with the ☉
28	11	2	☿ in conj. with ♂ diff. of dec. 0. 27. S.
	23	19	♃ in conj. with the ☽ diff. of dec. 3. 47. S.
29	4	2	♂ in conj. with the ☉
	18	36	♃'s first sat. will im.

J. LEWTHWAITE, Rotherhithe.

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CONJOINED SERIES.

No. CCXXVIII.

RECENT PATENTS.

To Thomas Ross, *of Coleman-street, in the City of London, Gent., for improvements in machinery for raising a pile upon woven and felted fabrics.*—[Sealed 18th April, 1850.]

These improvements in machinery for raising a pile upon woven and felted fabrics are applicable to the working of several kinds of cloth or fabrics, upon which it may be required to raise a pile or nap; but the principal object of the present invention is to work upon the face of linen cloth, for the production of a material known by the name of lint, and used for the covering of wounds and other surgical purposes. The main feature of these improvements consists in the employment of a peculiarly constructed scraper or scrapers for abrading the surface of the cloth or fabric which is to form the lint, and thereby partially breaking the fibres of which it is constructed, and producing a pile or nap upon its surface.

In Plate XIII., fig. 1, represents an end elevation of a machine suitable for the performance of the proposed pile-raising operation; fig. 2, is an elevation of the front of the said machine, shewing the situation and mode of working the scraper or scrapers by a rotary motion; and fig. 3, is a sectional elevation of the same machine, taken vertically through about the middle of fig. 2, and in an opposite direction to fig. 1. The parallel end frames of the machine are shewn at *a, a, a*; which, being suitably braced together, support the axles or shafts of the several rollers or wheels necessary for carrying the cloth or fabric through and bringing it under the opera-

tion of the scrapers; they also support the lateral mechanism by which the cloth or fabric is fed in, and the scrapers are made to revolve. The cloth or fabric intended to be operated upon is first wound round a roller *b*, which, being mounted in the machine by the ends of its axle bearing in notches in the frame, is enabled to turn freely. The cloth proceeds thence between a pair of fluted feeding-rollers *c*, *c*, and from these rollers over a bed *d*, under a straight-edged bar *e*, which hangs horizontally across the machine, for the purpose of keeping the cloth flat and tight upon the bed. The cloth thence passes over a ledge of thick leather *f*, extending along the edge of the bed; and upon this ledge of leather the abrading operation is effected by the rotary action of the scraping blades *g*, *g*, *g*, affixed to a revolving axle or shaft *h*. From the ledge of leather *f*, the cloth (having become napped by the action of the scrapers) passes under a guide-roller *i*, to the taking-up roller *k*, round the periphery of which it is wound by the rotation of a friction-roller *l*. This roller *l*, is made to revolve by means which will presently be described. The taking-up roller, it will be perceived, turns freely, with its axle hung in slotted grooves in the end frames, for the purpose of allowing it to rise and accommodate itself to any increase of diameter caused by the accumulation of the napped cloth or fabric winding round its surface; and, in order that it may have sufficient weight or bearing upon the driving-roller *l*, the ends of the axle of the taking-up roller are weighted by pendant-rods *m*, *m*, acted upon by a weight *n*, below.

The construction of the bed *d*, is as follows:—It consists of a long rail of iron, or other firm material, extending across the machine, and bearing on the end frames; and it is furnished with means of adjustment, for the purpose of bringing the cloth, as it passes over the bed, accurately against the edges of the rotary scrapers. The straight-edge bar *e*, is hung, at its ends, in slots in the frame, which enables its lower edge to bear evenly, and with due pressure, upon the face of the cloth or fabric passing under it. The rotary scrapers *g*, are blades of steel, formed with chisel-edges, affixed to arms extending from a shaft *h*; and the ledge of thick leather *f*, attached to the front edge of the bed, parallel to the scrapers, is hollowed or made concave on that side next to the scrapers, for the purpose of enabling the scrapers, as they revolve, to operate upon the face of the cloth through the whole depth of the leather ledge.

The working parts of the machine are actuated by the fol-

lowing means:—A band from a steam-engine, or other first mover, is passed over the fast pulley *p*, fixed upon a shaft *q*, mounted on the lower parts of the end frames, as seen in figs. 1, and 2. At the reverse end of this shaft, a band-wheel *r*, is attached, from whence a band passes over a pulley *s*, on the shaft *h*, of the scrapers, and turns the rotary scrapers in the direction shewn by the arrows,—that is, with the bevil of the chisel-edges of the scrapers forward; which is particularly to be observed; because, if turned in the opposite direction, the scrapers would become cutters, and shear off the pile, and probably cut the fabric into ribbons. At the opposite end of the shaft *h*, an endless screw or worm *t*, is affixed, which takes into a worm-wheel *u*, upon an oblique shaft, seen in fig. 1; and at the other end of this shaft a worm *v*, is fixed, taking into a wheel *w*, on the end of the axle of the lower feeding-roller *c*. The feeding-rollers are fluted, for the purpose of holding the fabric firmly when pressed together, and, consequently, they turn simultaneously, and advance the fabric forward (that is, feed it in) when driven by the gear, as described. The worm *t*, on the shaft of the scrapers also takes into a wheel *x*, fixed on the upper end of a vertical shaft, seen in figs. 1, and 2; at the lower end of which shaft there is a worm taking into a wheel *y*, on the axle of the friction-roller *l*, for the purpose of effecting the taking-up of the napped fabric.

A modification of the mode of suspending the straight-edge bar *e*, is shewn in two partial figures 4, and 5, upon an enlarged scale; in which it will be seen that, instead of placing the straight-edge bar in slots of the frame, as before described, it is affixed to levers *z*, mounted on jointed pieces on the bed-plate; there are also cams 1, 1, 1, on each end of the shaft of the rotary-scrapers, which, by passing over the studs 2, fixed in the lower parts of the levers *z*, cause the bar *e*, to be pressed down upon the bed, and held firmly there during every operation of each scraper.

Instead of employing rotary scrapers as described, the patentee sometimes applies a reciprocating pendulous movement to a single scraper, to effect the object of raising pile upon fabrics. For this purpose, he arranges his machinery as represented in sectional elevation at fig. 6, and in front view at fig. 7. The end frames of the machine are marked *a*, *a*, *a*, on which are mounted the shafts of the cloth-roller, feeding-rollers, and taking-up rollers, nearly as in the former, and in which the cloth or other fabric is shewn passing over a horizontal bed *d*, covered with leather, secured to the front part

2 M 2

of the machine with adjustments. A three-throw crank-shaft *c*, is mounted in the back part of the frame; and to this shaft is attached a compound lever-frame, consisting of several rods or bars, jointed together, and hanging upon a fulcrum-shaft *d*, mounted in the upper part of the frame. A detached view of the three-throw crank-shaft is shewn at fig. 8. From the middle crank of this shaft an upright bar or link *e*, passes to the tail-piece or arm *f*, which is jointed thereto. This arm *f*, is firmly keyed to the horizontal fulcrum-shaft *d*; and from the said fulcrum-shaft two arms or levers *g*, *g*, extend forward, as shewn in the horizontal view fig. 9. The ends of these arms or levers *g*, *g*, are, by joints, connected to two pendant rods *h*, *h*, affixed to the scraper-frame *i*, (see fig. 7,),—the scraper being a straight bar of steel *k*, formed, as before, with a chisel-edge. To the back part of the scraper-frame two horizontal connecting-rods *l*, *l*, are attached by joints, and carried back to the two outer cranks of the crank-shaft *c*, to which they are jointed. The movements of this machine are derived from a pulley *m*, on the end of the crank-shaft *c*; the other end of which shaft has a worm *n*, for communicating motion to the feeding and taking-up rollers, as in the former instance. The operations of the scraper, it will be perceived, are effected by the three-throw crank and the jointed rods and levers above described; by means of which, as the cloth travels over the bed *b*, the scraper *k*, will be moved forward on the face of the cloth, and thereby made to raise a pile upon its surface; and, in returning, the scraper will be raised off the cloth by the operation of the cranks of the shaft *c*, as described,—the scraper, by these means, being made to perform reciprocating pendulous movements.

The patentee claims, Firstly,—the novel adaptation of chisel-formed blades, as scrapers for raising pile on woven or felted fabrics, by working with the bevil-edges of the chisel-formed blades forward, so that they may be enabled to scrape the surface of the fabric and not cut it; and whether these scrapers shall be parallel to the axis of their shaft or inclined; and whether worked by rotary or reciprocating actions. Secondly,—the concave form and position of the ledge or bed of leather shewn in fig. 3, shaped to a curve concentric, or nearly so, with the axis of the rotary scraper. Thirdly,—the adaptation of the presser-bar for keeping the cloth or other fabric flat and tight upon the bed,—whether such presser-bar be made to operate by its own weight or by cams and levers, as described. And, Lastly,—the peculiar constructions of machinery, as shewn in the drawings.—[*Inrolled October*, 1850.]

To Cuthbert Dinsdale, *of Newcastle-upon-Tyne, dentist, for improvements in the manufacture of artificial palates and gums, and in the mode of setting or fixing natural and artificial teeth.*—[Sealed 15th April, 1850.]

This invention consists in making palates and gums of thin metal (of such a kind as will resist the action of all acids likely to be received into the mouth), and coating them, or partially coating them, with a substance (also capable of resisting vegetable acids) which will represent the natural appearance of the palate or the gum. As a consequence of this improved manufacture of gum, great support and stability will be given to the teeth, and a far closer imitation of nature will be presented than can now be attained by the ordinary mode of setting artificial or natural teeth.

The patentee first describes his invention in its relation to the gums and teeth, and afterwards explains its application to the manufacture of palates.

In manufacturing a complete set of teeth for a mouth deprived of teeth, and in which the alveolar process of both jaws is of consequence absorbed, a wax model is first made of the upper and lower maxillary process; and from such models two plates are formed, to fit those parts of the mouth. As these two plates are only to be used temporarily for fitting the teeth to the mouth, they may be made of copper, or any other suitable metal. The patentee then takes a set of teeth (mineral tube-teeth by preference, as they are not subject to decay from the action of vegetable or other weak acids), and fits them in their places on the metal plates with vertical pins, according to the ordinary practice. He next models upon each of the plates, and around the teeth (in wax, or other plastic material), a gum, to represent the natural gum which has been absorbed,—taking care to fit the work into the mouth, from time to time, in order that, while supplying the deficiences of the mouth, the proper form may be obtained for restoring the natural expression to the face. All the teeth having been thus fitted in their places, and a wax artificial gum modelled thereon, the teeth are taken off the pivots, leaving the wax undisturbed upon the plates, so that the sockets may always fit the teeth. A cast of the wax model and metal plates is now taken with plaster of Paris; and, as a cast of both sides of the model belonging to each jaw is required (that is to say, of the metal plate which fits the mouth as well as the artificial gum), the plaster cast must be made in two pieces, so that it will come off the model without in-

juring it. One half of each model will therefore be a cast of the part that fits the mouth; and the other half will be a cast of the wax gum that has the sockets for the teeth made therein. From the two plaster casts, forming together the counterpart of one model, two metal ones are cast (zinc, or other suitable metal, being used); which casts are dipped into melted lead or other soft metal, as is generally done in such cases,—the zinc serving the purpose of a die, and the softer metal the purpose of a counter-die. The patentee then proceeds to strike a plate of gold, or other suitable metal, of a proper thickness, into each die, and bring up the plates with punches, until they fit the respective dies. The two plates are then fitted together, leaving a hollow space between them; a proper joint, corresponding to the edge of the dies, is then made; and the two plates are soldered together; and thus a metal alveolar process, with the sockets for the teeth marked thereon, is produced. The upper plate, which is intended to form the gum, is cut out where marked for the teeth, and the teeth are placed in their proper sockets or holes, and a mark made through the tube of the teeth, for the pivot to be soldered into the plate. When this is done, and the teeth have been properly fitted, the inner surface of the alveolar process, or inner surface of the plates, is coated with enamel; after which, the teeth are placed upon their respective pivots in the sockets, and then soldered, or left to be fixed by the enamel alone;—the outer surface, or that which is intended to represent the gum, is then coated with enamel of a suitable color, which must be run or melted on; and, as the enamel is brought up to, and made to adhere to, the teeth, the latter will be firmly fixed, and form as it were one piece with the gum. Previous to applying the outside enamel, the tubes of metal which come through the teeth may be cut away so far down into the tooth as to admit of enamel, of a color to match the teeth, being melted in, so as to fill the tube at the end; which melting operation can be done when the outside surface is run;—care must however be taken that the solder used for causing the metal parts to adhere together be of a quality to resist the heat required to melt the enamel, and that the enamel shall melt at a temperature that will not affect the teeth. The enamelling may, if desired, be extended over that part of the surface of the plate which comes in contact with the mouth; but it is preferred to leave that part uncovered with enamel. The spring-carriages or clasps, required to fix the piece in the mouth, are of the ordinary kind, with this exception, that the spring-carriages are made thicker than usual, so as to admit

of the pivot on which the swivel works being screwed through into the cavity of the alveolar process, and thereby made to fill the hole which has been left to allow the air to escape;—this mode of attaching the spring-carriage admits of the springs being changed with facility: the spring-carriages should be attached before the enamelling process has been completed.

In fixing natural teeth into gums constructed as above, the enamelling must be performed with the teeth out of the gum, otherwise they would be injured by the heat; and they are cemented or fastened on to their pivots in the usual way,—being supported, and strengthened, and kept in their places by the artificial gum, without the advantage of the enamel adhering to them, as is the case with mineral teeth.

In Plate XIII., fig. 1, is a front view of a complete set of teeth fixed in artificial gums according to the improved plan; fig. 2, is a view of the under side of the upper jaw; fig. 3, is a sectional view, which will explain more clearly the manner in which the wax artificial gum is modelled round the teeth on the temporary metal plate, which is seen at *a*. The teeth *b*, are mounted on pivots *c*, secured to the plate; and the wax gum *d*, is modelled thereon, as above mentioned. Fig. 4, is a section, taken through fig. 2, at 1, 1. Upon inspecting this figure, which is drawn on an enlarged scale, the metal gum, it will be seen, is covered inside and out (except on the under side) with enamel, which adheres to the teeth, and firmly holds them in their sockets.

The patentee constructs artificial palates by first taking a wax model of the mouth, where the deficiency exists, and then taking a cast in plaster of Paris, and afterwards in zinc and lead, as before stated for artificial gums; a metal plate must then be made to fit the zinc die; and care must be taken to see that it also fits the mouth. A wax arch or palate must then be modelled upon this plate, as near as possible to the form of what the roof of the mouth ought to be; and, when this is completed, a cast must be taken from that in plaster of Paris, and zinc and lead dies made, as in the former case. Gold, or other metal plates, as the case may require, are then struck up by means of the lead and zinc dies, leaving the part hollow between the plate which will come against the mouth and the plate which will form the artificial palate—against which the tongue will come. Care must be taken that the cavity is made impervious to moisture, by screwing a pivot into the hole which may be required as an air-hole in soldering and enamelling the parts. If thought desirable, the enamelling may be extended over the whole surface; but it is

preferred to leave that part uncovered with enamel that comes against the roof of the mouth. These improved palates are fixed in the mouth with clasps round the teeth, or spiral springs, as the case requires.

The patentee claims the manufacture of hollow metal gums, and coating the same with enamel, whereby an increased support will be afforded to the teeth, and a close approximation (in appearance) to nature will, at the same time, be attained. He also claims the manufacture of palates as above described.—[*Inrolled October,* 1850.]

To George Robbins, *of Forest Lodge, near Hythe, in the county of Southampton, Gent., for improvements in the construction of railway carriages.*—[Sealed 7th May, 1850.]

This invention of improvements in the construction of railway carriages refers to improvements upon those parts of such carriages as serve to retard and stop the progress of a train; the object being to brake all the carriages of a train simultaneously, at the pleasure of the engine-driver or guard.

In Plate XIV., at figs. 1, and 2, one arrangement of apparatus, for carrying out the object of the invention, is shewn. Fig. 1, is a plan view of the under framing of a tender and passenger carriage, coupled together, shewing a system of self-acting brakes, which are brought into operation upon the running wheels by the inward movement of the buffer-rods; and also an arrangement of apparatus for preventing the action of the brakes when the train is being backed, and the motive power is necessarily applied to the carriages through the buffers, instead of through the draw-bars and chains. Fig. 2, is a longitudinal sectional elevation of the same, taken at the line 1, 2, of fig. 1,—the apparatus for preventing the braking of the wheels being in action. A, A, fig. 1, is the framing of the carriage, supported on the running wheels B, and carrying the buffers C, C, and the hooked draw-bars or rods D, as usual. The inner ends of the draw-rods are respectively furnished with straps *a*; each of which embraces and supports a buffer-spring, composed of two parts *b*, and *b**. The ends of these springs ride upon the shoes *c*, attached to the ends of the buffer-rods. The buffer-springs are divided into two parts *b*, and *b**, as shewn at fig. 1, to allow of an extraordinary amount of power, to resist the backward thrust of the engine being given to the buffers (by bringing the full

resisting power of the part *b**, into use) when the brakes are required to be kept free from the wheels. Near the periphery of each running wheel a brake E, is suspended from the framing by a joint-pin and bracket, as shewn; and attached to each buffer-rod is a spring F, which is brought into connection with one of the suspended brakes, and is made to bear upon the back thereof when the buffers are driven home; and by this means an elastic pressure is put upon all the wheels of the train of carriages. At about the middle of the framing A, two weighted tumbling or stop-pieces G, G, are mounted; from the lower side of the shorter or lighter limb of each of which an arm *d*, projects, for the purpose of carrying a friction-roller. *e, e*, are similar arms, attached to the framing A, but each carrying two friction-rollers, between which and over the pulleys of the arms *d*, a chain *f*, extending from one end of the carriage to the other, is passed. This chain *f*, is connected at either end to the link-pieces *g, g*, jointed one to either end of the framing A, of the passenger carriage, and carrying also a coupling-chain *h*, to be attached to a similar chain or swivel-attachment of the next adjoining carriage. When, therefore, this chain is brought to tension (at the time that the drag of the engine is upon the draw-rods and the buffer-springs *b, b*, b, b**, are made to slightly recede from each other, and thereby leave sufficient space for the tumbling-pieces G, G, to assume a horizontal position), the pressure of the chain *f*, upon the pulleys of the arms *d*, will draw the tumbling-pieces into the position shewn at fig. 2. By this means a solid unyielding substance will be brought in contact with the back of the strap *a*, of the buffer-springs, at the time that the part *b**, is subject to great pressure, by being drawn against the part *b*: an extra amount of resistance will therefore be presented to the buffer-rods, if a tendency is imparted to them to move inwards (as at the backing of a train), by reason of the springs not being able to assume their usual positions when released from the drag-chain of the engine; whereby the brakes (which are driven forwards by the movement of the buffer-rods) will be allowed to remain inactive. On the engine proceeding again in its forward direction, and the chain *f*, being slackened, the tumbling-pieces will, by reason of their own gravity, take the position shewn by dots at fig. 2, and release the parts *b**, of the springs from their extra pressure; the buffer-rods will then be free to move inwards as before, and bring the brakes into action when found requisite.

The means of taking up the slack of the chain *f*, and of

contracting the buffer-springs, so as to allow the tumbling-pieces G, G, to fall into a horizontal position, will be understood from the following description:—Mounted in suitable guides, below the framing A, of the tender (or, it may be, of the guard's carriage), are two sliding rods *i*, *i**, connected together by a strong helical spring *k*; and for each of these rods a catch-piece is provided, to regulate the distance of their traverse. To the outer end of the bar *i*, a swivel is attached, which is secured to the chain *h*, of the link-piece *g*; and to the opposite extremity of the bar *i**, to that which is secured to the helical spring *k*, a common carriage-spring *l*, is attached; the ends of which slide over suitable friction-plates or shoes, bolted to the framing; and to the opposite side of this spring, in a line with the bar *i**, a chain *m*, is connected. This chain is secured, at its other end, to a segment-piece *n*, which is keyed to a cross-shaft *o*, supported in suitable bearings on the framing A. Upon this shaft is also mounted a bevil-wheel *p*, which gears into a similar wheel on a vertical shaft *q*, to the upper end of which a winch-handle is affixed. Now, supposing the train to be quiescent, and that it is required to back the train, the mode of proceeding, to prevent the brakes from coming into action, is simply this:—The engine-driver or brakesman, by turning the winch-handle of the shaft *q*, partially rotates the segment-piece *n*, and takes up a portion of the chain *m*, which, through the agency of the rods *i**, and *i*, and the chain *h*, and link-piece *g*, will give tension to the chain *f*, and thereby cause the tumbling-pieces G, G, to fall into a horizontal position, on the train being moved a short distance ahead. When this movement has been effected, the train will be free to move in a backward course, without the brakes being brought into action. On releasing the chain *f*, from its state of tension, and reversing the direction of the progress of the engine, the self-acting brakes will be free to come in contact with the periphery of the wheels, whenever the speed of the engine is sufficiently retarded to cause the momentum of the train to drive in the buffer-rods. The use of the spring *l*, is to yield to any undue tension put on the chain *m*, by the brakesman. The helical spring *k*, is for the purpose of yielding, in case of too much strain being put on the chains *f*, and *h*, and of taking up any slack of those chains.

The patentee also shews several modifications of the apparatus, whereby he is enabled to carry out the object of his invention. The principle, however, on which they act, to prevent the recession of the buffer-rods to such a degree as would

suffice to bring the brakes into action, are the same in all the arrangements. Fig. 3, is a partial plan view of the bottom framing of a carriage, shewing an arrangement by which the recession or inward movement of the buffers may be arrested or prevented by the direct action of the tumbling-pieces on the buffer-rods; and fig. 4, is a partial sectional elevation of the same. In this arrangement four tumbling-pieces are employed in each carriage, as shewn at *a*, *a*,—one for every buffer-rod; and they are situate immediately behind their respective rods. These tumbling-pieces are mounted in suitable bearings, attached to the main framing; and they are connected together in pairs by means of cross rods, *b*, *b*, which are secured to the tumblers, as shewn at fig. 5, and carry, at the middle of their length, a forked piece, forming the bearing for a friction-pulley *c*. *d*, is a central bracket, carrying two friction-pulleys; and *e*, *e*, are other brackets, also carrying pulleys, to support the chain *f*, which, as in the former arrangement, is caused to rock the tumbling-pieces *a*, *a*, and bring them into a position to stop the movement inwards of the buffer-rods. *g*, *g*, are the brakes, suspended from the framing; and, for actuating the same, instead of the spring before mentioned, a bent rocking-lever *h*, (one for each brake) is employed,—which lever has its bearing on a pin in a bracket-piece *i*, bolted to the framing. The upper end of this lever is secured to the buffer-rod, and the lower end is jointed to a spring, with which the back of the brake is provided, as shewn at fig. 4: the inward motion, therefore, of the buffer-rod, will be immediately communicated to its brake through the intervention of the lever *h*, when the brake is required to be brought into action. The mode of operating with this apparatus is the same as that above described, with this exception, that the tumbling-pieces may be brought into the proper position for preventing the inward movement of the buffer-rods, without the power of the engine being required for compressing the buffer-springs.

Fig. 6, shews, in partial plan, and fig. 7, in longitudinal elevation, a modified arrangement, which admits of a set of brakes for four wheels being brought into operation by the action of one pair of buffer-rods only, and, consequently, rendering it unnecessary that more than one pair of tumblers shall be used to prevent (at certain periods) the buffer-rods from acting upon the brakes. In this instance, the motion of the buffer-rods is communicated (through an arm *a*, affixed thereto, and a connecting-rod *b*, jointed to the arm) to a vibrating-lever *c*, which rocks on a stud of a bracket *d*, project-

ing downwards from the framing of the carriage. At opposite sides, and at equal distances from the fulcrum of this lever, two connecting-rods *e, e,* are jointed,—their other ends being attached to a spring, with which the brakes *f, f***, are respectively provided at back. When, therefore, the pair of buffer-rods, which carry the arms *a,* are driven in, the pair of brakes *f, f***, will be forced against the peripheries of their respective wheels in the same manner as in the last-described arrangement. And when this action is not required at the time that an inward pressure is given to the buffers, the tumblers or stop-pieces *g, g,* are thrown into action by putting tension upon the chain *h,* as before described. Instead of jointing the connecting-rods *e, e,* to springs at the back of the brakes, they may be jointed directly to the back of the brakes; and the requisite yielding character may be given to the friction-surface thereof by the interposition of packing of vulcanized India-rubber.

Fig. 8, shews a modification which will admit of the tumblers being made to act upon short buffer-rods. In this case, a slot is cut in the side framing, to allow of the free movement of the buffer-rod, which is provided with a projecting-stud *a,* for the purpose of meeting the tumbling or stop-piece shewn at *b,* when the buffer-rod is not required to bring the brake into action. The tumbling or stop-piece will, in this arrangement, be caused to rise and fall as before described; and the brake is put in action by a fixed arm *c,* pendant from the buffer-rod, coming in contact with the brake. If thought desirable, in place of the arm *c,* the stud *a,* may be continued into a rod or bar, as shewn by dots in the figure, and made to act upon the upper end of an elastic lever, which, with a friction-piece at its lower end, forms a brake.

The patentee claims, as his invention of improvements in the construction of railway carriages, the means, hereinbefore described, whereby self-acting brakes may be brought under the command of the brakesman.—[*Inrolled November,* 1850.]

To William Macalpine, *of Spring Vale, Hammersmith, general dresser, and* Thomas McAlpin, *of the same place, manager, for improvements in machinery for washing cotton, linen, and other fabrics.*—[Sealed 23rd April, 1850.]

This invention consists in a mode of combining a rotating wash-vessel with vertical beaters, for the purpose of washing fabrics.

A vertical section of the improved washing apparatus is represented at fig. 1, in Plate XIII. *a,* is the framing of the apparatus; *b,* is the wash-vessel, which is preferred to be made with perforated false bottom and sides b^1, b^1, for the purpose of admitting steam more freely to act upon and heat the contents of the vessel; and *c,* is the axis, on which the vessel *b,* turns. *d,* is a bevilled cog-wheel, fixed to the bottom of the vessel *b,* and driven by a bevilled pinion (not shewn in the figure), which receives motion, through suitable gearing, from a steam-engine or other first mover; and there is a small pulley upon the same shaft as the bevilled pinion, from which motion is transmitted, by means of an endless band, to another pulley *e,* fixed on the end of the horizontal shaft *f.* The vessel *b,* is further supported by a hollow shaft *g,* which is fixed to the axis *c,* and turns, at its upper end, in a bearing *h;* and this shaft is connected, at the top (in such manner as to permit it to rotate freely), with a pipe *i,* by which steam is admitted into the hollow shaft *g,* and from thence passes, through openings at the bottom of the same, into the spaces formed by the false bottom and sides of the vessel *b.* The shaft *f,* carries ten lifters or tappets *j,* which serve to raise the vertical beaters *k.* These beaters, ten in number, are arranged in a row across the vessel *b,* (five on each side of the central hollow shaft *g,*); and they are guided, in their ascending and descending movements, by fixed guides *l.* The lower ends of the beaters are not all of the same size; for those of the two innermost beaters are about half the size of the lower ends of the outer beaters; and the intermediate ones gradually increase in size from the centre outwards;—the object being (as stated in the specification) to render the beating in some degree uniform, notwithstanding the circumstance that the parts of the fabrics under the outer beaters move faster than the parts of the fabrics near the centre. The beaters may be supported and kept out of action by means of stops *m,* which are permitted to assume the position shewn by dotted lines, so as to enter the notch k^1, of the beaters, by moving the axis *n,* by a handle at the end thereof. The beaters may be lifted higher than the position shewn at fig. 1, by the arrangement represented in the detached view fig. 2, consisting of two bent levers *o, o,* connected together, so as to be acted on simultaneously, by means of the rod *p;*—the short ends of the levers are situated beneath two rollers *q, q,* mounted upon the bar that carries the stops *m;* so that, when the rod *p,* is pulled in the direction of the arrow, the short ends of the levers will act upon the rollers *q, q,* and raise the stops; and

thus (supposing the ends of the stops to be projecting into the notches of the beaters) the beaters will be raised out of the way of the lifters *j*. The beaters are prevented from coming into contact with the false bottom of the vessel *b*, in their descending movement, by a stop k^2, on each, which descends on to a piece of India-rubber, or other elastic substance *r*, on the top of the framing *a*,—the object being to prevent injury to fine fabrics, in the event of only a few folds of such fabrics lying beneath the beaters.

The wash-water is discharged from the vessel *b*, through the spout *s*, and trough *t*, by drawing back a slide or valve from an opening b^2, in the bottom of the vessel *b*. *u*, is a screen, designed to protect the attendant from splashes;—it is lowered into the position shewn at fig. 1, when the apparatus is in operation; but, when the apparatus is not in action, the screen is raised into the position indicated by dotted lines; and for this purpose it is counterbalanced by weights, suspended from cords *v*, which pass over pulleys at the upper part of the frame *w*, and are attached to the screen.

The patentees state that they do not confine themselves to the above details, so long as the peculiar character of their invention be retained. They claim the mode, above described, of combining wash-vessel and beaters, for the purpose of washing cotton, linen, and other fabrics.—[*Inrolled October*, 1850.]

To Peter Armand Le Comte de Fontainemoreau, *of South-street, Finsbury, for certain improvements in the manufacture of wafers, and in the machinery or apparatus connected therewith,—being a communication.*—[Sealed 23rd April, 1850.]

This invention consists, firstly, in the application of thin slips or bands of metal or metallic alloys in the manufacture of wafers; and, secondly, in an improved apparatus for punching out wafers.

Three methods of manufacturing wafers, according to this invention, are described. In the first process, the metal slip or band is to be coated with the ordinary farinaceous paste (used for making wafers); and, for this purpose, the metal slip or band is laid on one of the jaws of the ordinary iron mould; then a spoonful of suitably-prepared flour paste is poured upon it; and, after this, the mould is shut, and the paste is baked, as is usual in the manufacture of common wafer-paste. The metal band, with the baked paste firmly

adhering thereto, is punched into wafers. The surface of the metal bands may be either plain or ornamental; and it may either exhibit the natural color of the metal or alloy, or be made to present an appearance similar to sealing-wax, by the application of a paint, composed of litharge and oil. This paint may be colored red by the use of sulphuret of mercury, or black by means of soot; or it may have any desired hue imparted to it by the employment of the ordinary mineral or vegetable colors. When the paint has been applied, the metal bands or slips are to be placed in a drying-chamber, heated to 122° Fahr., and kept therein for a period varying from twenty-four to thirty-six hours; and after this they are to be coated with a varnish, formed by mixing equal parts of copal varnish and distilled turpentine together.

The second method of manufacturing wafers consists in causing the metal slips or bands to adhere to strips of paper or tissue (which have been previously gummed on the under surface thereof) by means of size, and afterwards punching the same into wafers.

The third method consists in cementing strips of gummed paper or tissue to metal slips or bands, and then applying to the other side of the latter (which has been previously coated with an adhesive cement or pigment) a composition formed of Venice turpentine, bees'-wax, and sealing-wax. The wafers made by the first and second processes are caused to adhere to the letter or envelope by simply wetting the under surface thereof. The third kind of wafers require to be also warmed and a seal or stamp applied thereto, so as to produce any desired impression on the surface of the same. An appearance similar to gold, silver, copper, &c., may be given to the wafers by the application of suitable metallic powders.

The improved apparatus or press for punching out wafers is represented, in side elevation, in Plate XIII. *a,* is the framing of the press; *b,* is the follower thereof, which is depressed by means of a screw *c,* and raised again by a spiral or helical spring; *d,* is the lever for working the screw; and *e, e,* are frames, each containing four punches, soldered together,—there being a framework of transverse and longitudinal metal bars beneath the punches, to sustain them under the pressure to which they will be subjected. A band or slip of the prepared material is laid on the top of the punches; then the follower *b,* (which is made of wood, or of some soft metal that will not injure the cutting edge of the punches) is caused to descend, by means of the screw *c,* and lever *d,* and press the material down upon the punches; and thereby the band

or slip of prepared material is divided into wafers, which fall through the punches into the drawer *f*, below. On the lever *d*, being released, the spring, before mentioned, raises the follower; the remnant of the band or slip is then removed; a fresh band or slip is laid upon the punches; and the follower is caused to descend, as before.

The patentee claims, First,—the coating or covering the ordinary wafer-paste with a thin band or slip of any metal or alloy of metal, as before described. Secondly,—the baking of the wafer-paste simultaneously, in the ordinary iron moulds, with metallic bands or slips; by which baking the immediate adhesion is obtained between the paste and the metal bands which coat it, as before described. Thirdly,—the coating or covering of light paper or tissue slip, gummed on its lower surface, with thin metallic bands, by means of any kind of size, as before described. Fourthly,—the coating with a composition of wax and rosin the metal slips, by means of a siccative pigment, as before described. Fifthly,—the production of wafers, colored or not colored, and of the metallic bands, perfectly reproducing, under a suitable pressure, the impression, either sunk or in relievo, of seals, stamps, or of any other object, as before described. Sixthly,—the cutting apparatus, with its punches, as before described. Seventhly, —the mode of soldering together a certain number of punches, as before described.—[*Inrolled October,* 1850.]

To Edwin Heycock, *of Leeds, in the county of York, merchant, for certain improvements in the finishing and dressing of woollen cloths.*—[Sealed 26th January, 1850.]

This invention consists in an improved method of finishing and dressing woollen cloth by steam-pressure, without stretching the warp-threads or creasing the cloth from list to list.

There are two processes in common use for finishing and dressing woollen cloth by the aid of steam. In carrying out one process, the cloth is wound, in a damp state, around a perforated cylinder, and then submitted to the action of steam; and after this it is allowed to dry upon the cylinder, by which means the warp-threads are subjected to considerable tension from the contraction of the cloth in the act of drying. In the other process the piece of cloth is folded several times (transversely) and placed in a press, and steam is permitted to act upon it whilst it is under pressure; but as the pressure is exerted on those parts where the cloth is folded, a crease is

formed from list to list, at those places, and becomes a permanent blemish.

To prevent the above evils is the object of this invention; and the apparatus employed for this purpose is represented in Plate XV.; fig. 1, being an elevation thereof; fig. 2, a side view of the pressing part of the apparatus; and fig. 3, a side view of that part of the apparatus which is used for drawing the cloth along. *a,* is the framework of the apparatus; *b,* is a hollow table or chamber, fixed thereon for the reception of steam, which enters at *d,* and the water produced by the condensation thereof runs away at *e*; and *c,* is a perforated metal plate, which covers the chamber *b,* and serves as the lower plate or bed of the press. *f,* is the top plate or follower of the press, the under side of which is covered or faced with wood; and it is raised and lowered by means of two screws *g,* fixed thereon, and working in nuts *h.* These nuts are supported by the cross-heads *i,* which are secured on the top of the pillars or standards *j*; and upon each nut is fixed a bevil toothed wheel 1, which forms part of the train of wheelwork 1, 2, 3, 4, 5, 6, 7, 8, 9; so that on turning the handle *k,* on the axis of the pinion 9, the nuts will be caused to rotate and raise or lower the screws *g.*

The apparatus for drawing the cloth from under the plate *f,* after pressure, consists of a carriage *l,* furnished with two pinching-bars *m,* which are caused to advance towards or recede from each other by turning the handle *n,* and thus communicating motion through the shaft *o,* and bevil gearing *p, q,* to the double-screwed shafts *r,* which work in female screws formed in the ends of the pinching-bars *m.* The carriage is moved along the framework *a,* by means of two pinions *s,* which gear into two racks *t,* (fixed on the framework *a,*) and are caused to rotate by turning the handle *u,* upon the end of the shaft *v,* that carries the pinions. The carriage is steadied in its movements by eight small wheels or rollers *w,* which run in contact with the upper and under surfaces of the top rails of the framework *a.*

The mode of finishing and dressing woollen cloth, by means of the above-described machinery, is as follows:—Several pieces of cloth, in an extended state, are laid, one above the other, upon a wooden platform or table *x,* (the upper surface of which is level with that of the plate *c,*) until a pile of cloth, of a suitable thickness, is obtained; or if the width of the cloth should be about double that of the plate *c,* then each piece must be folded at the centre thereof, before the several pieces are piled upon the table *x.* A portion of the

pile of cloth, about equal to the length of the top plate or follower *f*, is introduced into the press (a cloth being interposed between it and the perforated plate *c*,); and the plate *f*, is then brought down upon the cloth, by means of the screws *g*, and the gearing connected therewith. Steam is now admitted into the hollow chamber *b*, and, ascending through the perforations of the plate *c*, penetrates through and acts upon the several thicknesses of cloth beneath the plate *f*; but the steam is prevented from escaping, or from penetrating into the unpressed portion of the pile of cloth, by the top plate being made of such dimensions as to extend beyond the perforated part of the plate *c*, and forcibly compress that portion of the cloth which lies between it and the unperforated part of the plate *c*. When the cloth has been subjected to pressure and steaming for a sufficient length of time, the steam is shut off, and the top plate *f*, is raised; and then the several thicknesses of cloth are separated for a few moments, to permit the steam to escape from between them. The end of the pile of cloth is now introduced between the bars *m*, which are made to pinch it firmly by turning the handle *n*; and the carriage *l*, is then caused to recede from the pressing machinery (by turning the handle *u*,) and draw the pile of cloth along with it, until the whole of the pressed portion thereof has been withdrawn from the plate *c*, and a fresh length of cloth deposited thereon. The plate *f*, is now brought down, and the steam turned on, as above mentioned. These operations are repeated until the whole of the pile of cloth has been pressed and steamed.

In place of several pieces of cloth being piled one above the other, the proper substance of cloth to be operated upon may be produced by folding a single piece of cloth in lengths exceeding that of the top plate *f*, so that the parts where it is folded will not be subjected to pressure. After the piece of cloth, so folded, has been pressed and steamed, it is to be refolded in such manner that the parts where it was previously folded will come beneath the plate *f*; and then the piece of cloth is to be again pressed and steamed; whereby the finishing and dressing of the cloth will be effected without creasing it from list to list at those places where it is folded.

The patentee claims, as his invention, the finishing and pressing woollen cloths by steam pressure, without stretching the warp-threads of the cloths or creasing the cloths from list to list.—[*Inrolled July*, 1850.]

To William Hargreaves, *the younger, of Bradford, in the county of York, iron-founder and whitesmith, for certain improvements in the means of consuming smoke;—parts of which improvements are also applicable to the generating of steam.*—[Sealed 18th April, 1850.]

This invention consists, firstly, in certain improvements in the construction and working of steam-boiler furnaces, for the purpose of consuming smoke [or, more correctly, consuming fuel in such manner as to produce little or no smoke]; and, secondly, in an arrangement of water-pipes, connected with, and forming part of, the furnace and steam-boiler, and designed to facilitate the generation of steam.

A sectional representation of a furnace, with part of a steam-boiler, constructed and arranged according to this invention, is given in Plate XIV. *a,* indicates the fire-bars, which are moveable, and rest, near each end, on a transverse bar, carried by upright vibrating-levers *b.* These levers are mounted on horizontal axes *c,* c^1; and the front axis *c,* is provided with a long horizontal arm or lever *d,* to which a vibratory motion is imparted from a steam-engine or other prime mover. The vibratory motion of the lever *d,* causes the levers *b,* fixed upon its axis, to vibrate also, and thus to move the fire-bars alternately to and fro in the direction of their length. The fire-bars are to be placed very near to each other, so as to leave only small interstices between them; and the upper surfaces thereof should incline downwards from the front part of the furnace to the bridge *e.* *f,* is the fire-door, which is raised and lowered by means of the chain *g*; *h,* is a hopper, for supplying the furnace with fuel, having a sliding-door *i,* capable of being raised and lowered by turning a handle on the axis of the pinion *j,* which gears into a rack fixed on the sliding-door; and *k,* is a piece or block of metal, affixed to the ends of the fire-bars, and, consequently, moving therewith. When the fire-bars move in the direction indicated by the arrow, the sliding-piece *k,* recedes from the fire-door *f,* and thereby permits some of the coals to fall from the hopper on to the dead-plate *l*; and, on the return movement of the fire-bars, the piece *k,* forces these coals forward on to the fire-bars. It will therefore be evident that the fuel will be gradually impelled along the fire-bars towards the bridge *e,* (the small spaces between the bars permitting only the fine ashes to fall through into the common ash-pit *m,*) and will be advantageously consumed; and at last the ashes, with a small quan-

tity of cinders, will be forced over the bridge *e*, into the ash-pit *n*: the gradual progression of the fuel, and the rising and falling motion of the fire-bars, effectually prevent the formation of clinkers.

The arrangement of pipes for facilitating the generation of steam, consists of two horizontal pipes *o*, one at each side of the furnace, extending from the front part thereof as far back as the bridge *e*;—these pipes are connected together by eight arched pipes *p*, the ends of which are securely fixed to the pipes *o*, over suitable openings therein; and the pipes *o*, are connected with the bottom of the boiler, at the bridge *e*, by two feed-pipes *q*, and with the front of the boiler, at the water level, by two pipes *r*. The object of this arrangement, as stated by the patentee, is to cause the water to descend from the boiler through the pipes *q*, and, after circulating through the pipes *o*, and *p*, and becoming highly heated, to return to the boiler through the pipes *r*.

The patentee does not confine himself to the above details. His claims are as follows:—"First, I claim, as my invention, the general arrangement, or form and construction, of the furnace, as relates to the smoke-consuming process, and the mechanical arrangement of feeding and distributing the coal evenly over the surface of the bars, by the process fully described and set forth; also the mechanical arrangement, as explained, to obtain the horizontal traverse of the furnace-bars; also the form of said bars, both to admit of said motion and their arrangement as to the interstices between them; and the inclination of the bed of bars *a*, to a fall, as described: the whole of this said recited claim appertains to my invention for consuming smoke. Secondly, I claim, as my invention, the form and construction of hollow tubes, as arranged in this my said invention, for containing water for generating steam,—being the arrangement of tubes or pipes, in the positions shewn over the furnace-bars, for generating steam; and the feed-pipes and side pipes in connection therewith,—forming the whole arrangement, as explained and set forth, for generating steam: this said recited claim appertains solely to my invention for generating steam. Thirdly, I claim, as my invention, the economy in the consumption of fuel required for working steam-boiler furnaces (as explained in the first part of my invention, and resulting from the consumption of carbon, smoke, and all other gases combined with the economy in the consumption of fuel, resulting from, and explained in, the second part of my invention), obtained by the

more speedily raising the water in the boiler to boiling heat; whereby steam is generated with a less quantity of coal than in the ordinary method, and as heretofore practised."—[*Inrolled July,* 1850.]

To John Slack, *of Manchester, in the county of Lancaster, manager, for his invention of certain improvements in the manufacture of textile goods or fabrics, and in certain machinery or apparatus connected therewith.*—[Sealed 21st February, 1850.]

This invention refers to the treatment of textile goods or fabrics, by submitting them to a process of stiffening during the ordinary operation of the loom in which they are woven. In order to accomplish this, suitable machinery or apparatus is placed in connection with the loom, for the purpose of conveying a solution of gum, "gum-substitute," or other appropriate mucilaginous substance, to the said goods or fabrics, previously to, or as they are in progress of, being wound upon the cloth-beam.

The patentee has shewn, in his specification, a drawing of a loom, with the means for carrying out his invention applied thereto; but the following description will suffice to explain his apparatus and mode of working:—Beneath the ordinary cloth-beam (which is caused to take up the work, as produced, by any of the usual methods) a trough is placed, within which a roller of wood, or other suitable material, is mounted, and made to turn in bearings formed therein. To each end of the trough is connected, by means of a hook, one end of two levers, which turn on fulcrum-pins, carried by brackets attached to the framework of the loom. These levers are connected together by a transverse rod, and are weighted at their backward ends. By this arrangement, the roller, which turns in the trough, will be kept in contact with the fabric as it is in progress of being wound upon the cloth-beam. The trough is supplied with a solution of gummy substance, intended to afford the required stiffness to the goods; so that, as the cloth-beam revolves, in the ordinary action of taking up the work, the roller, by being kept in contact therewith, will also turn in its bearings, and take up the stiffening matter from the trough, and press it into the manufactured material. When it is desired to free the roller from contact with the fabric upon the cloth-beam, it will merely be necessary for the workman to raise the weighted ends of the levers, and retain

them in that position by means of a hook, or other suitable apparatus, connected to the framework of the machine. The substance used for imparting the required stiffening should be of a consistency adapted to the quantity which it is desired that the roller should convey to the fabric, and may be composed of gum, gum-substitute, or any of those substances usually employed for such purposes,—varying, of course, in purity, &c., according to the nature of the fabric under operation. In order to prevent dust, lint, or other impurities from falling into the trough, a piece of cloth, wood, or other suitable material, should be attached to the framework of the machine, so as to form a screen to the trough.

It will be evident that many modifications of the apparatus, above described, may be employed for effecting the object of this invention; for instance, two or more rollers may be employed to transfer the mucilaginous substance to the fabric; or, if thought desirable, the woven goods may be conveyed through a vessel containing the gummy solution, and pass from thence to the ordinary cloth-beam. The patentee does not, therefore, confine himself to the precise arrangement described; but he claims the stiffening of textile goods or fabrics by the application of a gummy or gelatinous substance or substances, effected through the agency of suitable machinery or apparatus, operating in connection with the machinery by which the said goods or fabrics are manufactured.—[*Inrolled August*, 1850.]

To Conrad William Finzel, *of the City and County of Bristol, sugar refiner, for improvements in the processes and machinery employed in, and applicable to, the manufacture of sugar.*—[Sealed 12th October, 1849.]

This invention consists, firstly, in a mode of applying steam or liquids to the centrifugal machines employed for separating fluids from sugar, for the purpose of clearing, and keeping clear, the meshes or apertures in the periphery of the revolving cylinders or drums of such machines: which meshes or apertures, without this provision, speedily become clogged and stopped up with the sugar.

In Plate XV., fig. 1, is an elevation, partly in section, of a centrifugal machine, having the means of carrying out the above improvement applied thereto. Fig. 2, is a vertical section, and fig. 3, a front view (both on a larger scale than fig. 1,) of the perforated box, by which steam is caused to act against the periphery of the cylinder or drum of the machine. In

the outer case *a*, a narrow recess *b*, of nearly the same height as the revolving-cylinder or drum *c*, is formed; and in this recess is placed the steam-box *d*, connected by a pipe *e*, with a steam-boiler. The side of the box *d*, which is nearest to the cylinder *c*, is perforated with small holes, through which the steam rushes in numerous jets against the periphery of the cylinder *c*; and such steam is prevented from escaping from the machine by the application of lids *f*, to the top of the case *a*.

The mode of operating with the machine is as follows:—The sugar having been mixed with molasses or syrup, to bring it to the proper consistency, is put in the cylinder *c*, which is then caused to rotate; and after the cylinder has made a few turns, the steam is let on (by turning a cock on the pipe *e*,) and permitted to issue freely through the holes in the box *d*, against the periphery of the cylinder for about a minute,—which has the effect of clearing the meshes or apertures of such cylinder. The state of the sugar may be ascertained, from time to time, without stopping the machine, by raising the lids *f*; and if the extraction of the moisture therefrom appears to be impeded, steam is to be again let on for a short time, in order to clear the meshes or apertures. The cylinder *c*, is to be kept rotating, and the occasional steaming repeated (when necessary), until the whole, or nearly the whole, of the syrup or fluid is extracted from the sugar; and this, when operating upon ordinary sugar, will generally be effected in a few minutes. Sugars taken from the evaporating-pan, after partial cooling, may be put into the machine and operated upon in the manner just described: such sugars, of course, do not require syruping or mixing. The patentee states that, instead of steam, liquids may, by means of his invention and of a force-pump or other similar-acting machinery, be thrown against the periphery of the cylinder,—but, as he believes, with less advantage than steam.

The second part of the invention consists in a mode of preparing such sugars as require to be mixed with liquid before being operated upon by centrifugal machines.

The apparatus employed by the patentee for this purpose is shewn in vertical section at fig. 4. It consists of a vessel with a series of steam-pipes fixed in it, and of a centrifugal sieve and centrifugal drum, both fixed upon the same shaft, which revolves in the vessel. *a*, is the vessel, in the centre of which a vertical shaft *b*, is mounted. This shaft, for about two-thirds of its length from the top, is made hollow; and upon it is fixed a small centrifugal drum *c*, having a perforated

periphery, and provided with divisions or leaves, projecting inwards, to impart to the fluid (which enters into it through openings in the shaft *b*,) the centrifugal force of the speed given to the shaft. The shaft *b*, also carries a sieve *d*, the meshes of which are made coarser or finer according as it is required to divide the crystals of sugar more or less finely; and for the better division of any lumps that there may be in the sugar, the sieve is furnished with a number of metal points d^1. As the speed with which the sieve may revolve, without throwing the sugar over the edge thereof, will depend upon the angle or degree of curvature given to its sides, that must be regulated to suit the description of sugar to be operated upon; and a receptacle *e*, is formed at the upper part of the vessel, to receive any lumps that may happen to be thrown over the top of the sieve. Beneath the sieve several perforated steam-pipes *f*, are fixed, for the purpose of causing steam to be brought in contact with the particles of sugar which pass through the sieve.

The following is the method of preparing sugar by means of this machine:—Motion being communicated to the shaft *b*, and steam being admitted into the pipes *f*, through the pipe f^1, the syrup or liquid, with which the sugar is to be mixed, is introduced into the drum *c*, through the shaft *b*. The sugar, which has been prepared by breaking or crushing the lumps thereof, is deposited in the centre of the sieve; from whence it is thrown, by the centrifugal action, through the meshes of the sieve; it then descends through the steam that issues from the pipes *f*, whereby it is moistened and prepared to receive the syrup, which is thrown from the drum *c*, and, coming in contact with the sugar, becomes mixed therewith.

The third part of the invention relates to certain improvements in the apparatus connected with the vacuum-pan used by sugar refiners,—the object being to effect the saving of a portion of saccharine matter which has heretofore been carried off along with the steam or vapour and air in the ordinary process of boiling.

Fig. 5, is an elevation, partly in section, of a vacuum-pan, with the improved apparatus applied thereto. *a*, is the vacuum-pan, the head *b*, of which is connected by a copper pipe *c*, with a condenser *d*,—shewn, in vertical section at fig. 6. The condenser consists of a metal cylinder with conical ends, which are separated from the body of the cylinder by plates *e*; but a communication is established between the two ends by a series of copper pipes *f*, which are inserted at top and bottom into the plates *e*. At the bottom of the cylinder there is a

pipe *g*, by which cold water is admitted into it; and at the top there is a pipe *h*, through which the water flows away. The bottom of the condenser is connected with a receiver *i*, by a pipe *j*, provided with a stop-valve, which can be worked by means of the crank-handle *k*. The receiver is furnished with steam-pipes i^1, for evaporating the water of condensation, as represented at fig. 7,—which is a plan-view of the receiver *i*, with the top removed. The receiver is connected by a pipe *l*, with a second condensing vessel *m*, which is divided longitudinally, near the top, by a perforated plate *n*, supported by vertical bearers *o*. There is a perforated pipe *p*, at the top of the condenser *m*, by which cold water is supplied to the upper compartment thereof, whence it descends in a shower through the perforations in the plate *n*, and condenses the aqueous vapour in the lower compartment. The condenser *m*, is connected with the exhausting pumps by the pipe *q*.

The progress of the operation is as follows:—As the vapour from the vacuum-pan passes through the condenser *d*, a portion of it is condensed in the pipes *f*, together with the saccharine matters, and flows from the bottom of the condenser into the receiver *i*, in the state of a weak solution of sugar. Steam being admitted into the pipes i^1, the heat thereof (in combination with the action of the exhausting pumps) evaporates the solution to a more concentrated state; and then it may be drawn off through the pipe *r*;—air being at the same time admitted into the receiver through a cock at *s*, to supply the place of the liquor as it flows away. If the pumps are kept in action during this part of the process, a throttle-valve must be used to close the pipe *l*.

The patentee claims, First,—the mode of applying steam or liquids to machines used for separating syrups or fluids from sugar by means of centrifugal force, for the purpose of clearing and keeping clear the meshes or apertures in the periphery of the revolving cylinders of such machines, as above described; but he does not confine himself to the particular apparatus described, although he believes the same to be the best adapted for the purpose. Secondly,—the mode, above described, of preparing such sugars as require mixing with liquid before being operated upon in the centrifugal-acting machines firstly before mentioned. Thirdly,—the arrangement or combination of machinery above described, so far as regards the combination of the condenser *d*, with the other parts of such machinery, for the purpose of obtaining from the vapour arising from the vacuum-pans the greater portion of the saccharine matters contained therein, in manner above described.—[*Inrolled April,* 1850.]

To Robert Dalglish, *of Glasgow, in the county of Lanark, in Scotland, merchant and calico printer, for certain improvements in printing, and in the application of colors to silk, cotton, linen, woollen, and other textile fabrics.*— [Sealed 7th May, 1850.]

This invention relates to the machinery used for printing and applying color to silk, cotton, linen, woollen, and other textile fabrics, and consists in so arranging such machinery, and applying additional parts thereto, that the "blanket" may be washed at the same time that the printing is going on, in order continuously to present clean portions of the blanket to the fabric which is being printed; and thus to render unnecessary the interposition of a fabric between the blanket and the fabric to be printed.

The parts of the machinery by which the color is applied to the fabrics being of the ordinary kind, the patentee has shewn, in the drawing attached to his specification, merely the new parts, whereby the cleansing of the blanket is effected. The apparatus for washing the blanket is represented in Plate XIV. *a*, is the roller or beam, on which the fabric *b*, intended to be printed, is wound; from this roller the fabric passes over the roller *c*, and then partly round the cylinder *d*, where the color is applied to it by the ordinary apparatus; and then the fabric passes upwards over the roller *e*, and is conducted over a number of steam-boxes *f*, whereby it is dried. *g*, is the endless blanket, which is interposed between the cylinder *d*, and the fabric to be printed, and receives a portion of the color which passes through the fabric; it then ascends with the fabric until it reaches the roller 1, over which it proceeds, in a horizontal direction, to the roller 2; and then it descends to the roller 3. The blanket, in its descent, is subjected to the action of numerous jets of water from the horizontal perforated pipes *h*, connected at each end with a vertical water-pipe. The water serves to loosen the color; and it is then removed by sets of brushes *i*, which are worked with a reciprocating action by connecting-rods *j*, from two horizontal shafts *k*,—the blanket being sustained, while the brushes are acting upon it, by boards *l*. After the brushes have acted on the blanket, it passes under the roller 3, and ascends to the roller 4. In its ascent, it is first exposed to numerous jets of water from a perforated pipe h^1; after which, it is acted on by a scraper or doctor *m*; and then it comes in contact with a roller *n*, covered with sponge, for the purpose of freeing the blanket from water, which is afterwards squeezed out of the

sponge by a pressing-roller *o*. From the roller 4, the blanket passes over the rollers 5, 6, and 7, to a drying apparatus (not shewn in the drawing), consisting of three metal cylinders heated by steam; and it returns from such apparatus, in a dry state, over the rollers 8, 9, 10, to the cylinder *d*. *p*, *p*, are two steam-cylinders, around which an endless belt *q*, of any suitable fabric, passes, and is thereby kept in a heated state; and this fabric, by coming in contact with the blanket between the rollers 6, and 7, transmits heat thereto, and thus dries it: this drying apparatus may be used in conjunction with the first-mentioned drying apparatus; or either apparatus may be employed separately. *r*, is a trough, for collecting and carrying off the water used for washing the blanket; *s*, is a trough, for collecting the water that drops from the boards *l*; and *t*, is a sheet of felt, intended to prevent the heat of the steam-boxes *f*, from acting on the soiled portion of the blanket as it passes between the rollers 1, and 2.

The patentee says, he is aware that waterproof cloths or fabrics, used as printing-blankets, have been cleansed in their passage through printing-machines; but this cleansing was effected when the machine was not employed in the operation of printing, and, consequently, involved a loss of time. He has also been informed, that it has been attempted to wash the grey or unbleached cloth which is used between the white cloth to be printed and the cylinder-cloth or blanket. He mentions these circumstances, in order to state that he does not make any claim thereto; nor does he claim any part of the machinery above mentioned or described, or mode of erecting the same, when separately considered. What he claims is,—the so arranging machinery employed for printing and applying color to silk, cotton, linen, woollen, and other textile fabrics, that the blankets, or fabrics called by that name, may be washed at the same time that the printing is going on, in order continuously to present clean surfaces, and thus to dispense with the necessity of using interposed fabrics between the blankets and the cloths to be printed.—[*Inrolled November*, 1850.]

To Jules Frederick Maillard Dumeste, *of Paris, for certain improvements in reflectors for luminaries.*—[Sealed 22nd May, 1850.]

This invention is stated to consist in obviating the shade in apparatus for illuminating, and in multiplying the effect of light, by means of corrugated glasses.

In Plate XV., fig. 1, is an elevation of a gas-burner and

glasses, arranged according to this invention; fig. 2, is a detached sectional view of the burner; fig. 3, is a plan view, and fig. 4, a vertical section, of the corrugated reflector; and figs. 5, exhibit a side view and an under-side view of the instrument by which the glass chimney is retained in its proper position. The burner *a*, is formed with a shoulder *b*, to support a ring *c*, which is slipped over the top of the burner. From this ring three arms *d*, project, and carry a plate *e*, which is suitably recessed to receive and hold the metal cap or deflector *f*. A metal rod *g*, is rivetted to one of the arms *d*, and passes upwards through a hole in the corrugated reflector *h*, to the top of the glass chimney *i*, for the purpose of sustaining the little instrument by which the chimney is retained in a vertical position. The glass reflector *h*, may be corrugated inside as well as outside; and it may rest upon the edge of the plate *e*, or on the arms *d*. It supports the glass chimney *i*, which may be corrugated both externally and internally. The chimney *i*, is held in a proper position by means of the instrument *j*, which is applied to the top thereof, and is fixed at any desired elevation on the rod *g*, by means of a thumb-screw *k*.

The patentee states, that he does not confine himself, in the application of his invention, to any particular construction of lamp. He claims, First,—the application of a corrugated glass socket or reflector for supporting the glass or chimney of gas-burners, and their employment in conjunction for multiplying the effects of light, as above described,—reference being had to figs. 1, 2, 3, and 4. Secondly,—the mode of maintaining the glass or chimney of gas-burners in a vertical position, as above described,—reference being made to figs. 1, and 5.—[*Inrolled November*, 1850.]

To Richard Laming, *of Charlton, in the county of Kent, chemist, and* Frederick John Evans, *of Westminster, in the county of Middlesex, gas engineer, for improvements in the manufacture of gas for illumination and other purposes to which coal gas is applicable; in preparing materials to be employed in such manufacture; and in apparatus for manufacturing and using gas; also improvements in treating certain products resulting from the distillation of coal; parts of which above-mentioned improvements are applicable to other similar purposes.*—[Sealed 23rd April, 1850.]

The first part of this invention consists of an improvement in retorts for making gas, and for other uses; and in making

pots, crucibles, muffles, stoves, fire-bricks and lumps, and other articles of clay, required to stand the action of fire without cracking. The improvement consists in mixing with the fire-clay, which is to enter into the composition of any of the aforesaid articles, about 0·25 per cent. of its weight of asbestos or fibrous silicate of magnesia: the vessels are then to be constructed and burned in the usual manner. The patentees state that they do not confine themselves to any particular forms of the articles, each of which may be made of one or more pieces, as at present; and the proportion of silicate of magnesia may be varied to meet the exigencies of particular cases,—its introduction being for the purpose of giving greater tenacity to the materials used, and thus diminishing their tendency to become cracked under the influence of change of temperature.

They claim, under this head of the invention, the introduction of asbestos or fibrous silicate of magnesia among the materials used for making articles of clay, intended to be submitted to a great heat; and the use of all such articles, made with asbestos or fibrous silicate of magnesia in their composition.

Another part of this invention consists in an arrangement of apparatus for making gas from oil, tar, melted pitch, resin, fat, or other analogous material, in conjunction or not with water. The apparatus consists of an iron or clay retort, composed of two horizontal chambers, one above the other, and communicating at the back only. The ends of the chambers are closed by three man-hole doors; two of which are secured over the front ends of the chambers; and the third, which is a large door, serves to close the hind ends of both chambers; —the three doors all projecting beyond the brick-work setting of the retort. Upon the upper chamber, near the front end thereof, is an inverted funnel, of large diameter, closed by a cover; the edge of which is turned down, and dips into an hydraulic joint, or into a joint filled with metal, fusible at the temperature to which it is exposed; or else it is secured in the same manner as the ordinary man-hole doors. The cover is fitted with a double syphon, furnished with a stop-cock. The eduction-pipe, leading to the hydraulic main, is connected with the front end of the lower chamber of the retort. To use this apparatus, previously raised to the usual temperature, the patentees charge the upper chamber with coke,—heaping it somewhat just beneath the funnel, and allowing some pieces to fall over against the large man-hole door at the back; and they charge the lower chamber either with coal or coke. A stream of oil, tar, melted pitch, resin, fat, or other analogous

matter, in conjunction with water or not, is then allowed to fall from the double syphon, through the large funnel, on to the red-hot coke beneath; it passes thence, partly as gas and partly as liquid, through the upper chamber to the back of the lower one, along which it next proceeds, chiefly in the state of gas, and escapes, mixed with the gaseous products of the lower chamber, through the eduction-pipe into the hydraulic main. When the lower chamber of this apparatus is charged with coal, the liquid should not be permitted to flow from the double syphon until the coal has had time to give off the greater part of its richer gas, and to become heated throughout; but when coke is used in both chambers, the liquid is admitted from the commencement, and without intermission, until the passages of the gas apparatus need to be opened and cleaned out.

The patentees do not claim the making of gas from tar, or any other form of hydro-carbon, or water, by means of red-hot coke; or the combining of any materials for affording gas. What they claim is, the combination and arrangement of the apparatus, particularly of the large funnel, with the double chambers, and back and front man-hole doors, for making gas by the decomposition of any suitable hydro-carbon, or water, by bringing it, in a fluid state, into contact with red-hot coke or other suitable material.

Another part of the invention consists in elongating the eduction-pipes of retorts, used for making gas for illumination, into their interior, and arranging them in lines near their axes. The farther ends of these pipes are left open; and they are supported by bearers. Holes should be made along the pipes, but only in sufficient number to permit of the free escape of the gas as it is generated; or a longitudinal slit may be made in the under side of the horizontal pipe, from its further end to near its ascending portion; and this arrangement is preferred, because it admits of the passage being cleared out by a proper tool, in the event of its becoming choked. The improvement is applicable to retorts of any material, and of the ordinary forms; but it will be found more easy to charge the retorts, to which this improvement is applied, when they are made wide enough to receive a charging-scoop on either side of the horizontal eduction-pipes. The object of the improvement is to diminish the contact of the gas with a surface heated high enough to cause it to deposit some portion of its carbon; and thus to produce a richer gas, or a larger quantity of equally rich gas, from a given quantity of coal.

The claim made under this head is for the elongation of

the eduction-pipes of retorts, used for making gas for illumination, along or near their axes.

Another part of the invention consists in a process for obtaining light by means of platinum, heated to whiteness by coal-gas or peat-gas. It is known that, when water is decomposed, and the resulting hydrogen burnt within a small cage, made of platinum wire or platinum foil, in such a manner as to heat the metal to whiteness, the platinum becomes luminous, and remains so as long as its temperature is maintained; but it is equally well known, that hydrogen-gas, resulting from the decomposition of water, is not readily obtainable under the generality of circumstances where light is required. The improvement consists in replacing hydrogen-gas from water, by coal-gas (which is to be obtained almost universally, and which answers the purpose), or by peat-gas. In carrying out this improvement, it is preferred to burn the gas, either by itself, or mixed with atmospheric air, within a platinum wire cylinder, greater in height and diameter, and made of coarser material, as the quantity of gas burned within it in a given time is greater,—the only practical rule that it is necessary to give being, that all the metal be placed, with respect to the flame, in the best position for becoming white hot. The advantages which result from this part of the invention are,—first, with respect to ordinary coal-gas, that more light is obtained, in proportion to the quantity of coal-gas consumed, than is the case when platinum is not used; and, secondly, that, by its means, a good light is obtained by the combustion of peat-gas or of coal-gas of inferior quality.

Under this head, the patentees state, that they neither claim nor restrict themselves to the use of any particular form or dimensions of the platinum apparatus; but what they claim is, the use of coal or peat-gas, mixed or not with air, for heating platinum wire or foil to whiteness, and thereby producing light.

A previous patent has been obtained by one of the patentees (Mr. Laming) for purifying coal-gas by a solution of muriate of iron, mixed with porous materials; and also by muriate of iron, decomposed by lime into chloride of calcium and oxide of iron, and made porous by suitable materials. Now, one part of the present invention consists in combining known processes, so as to obtain the last-named purifying materials. The patentees decompose sulphate of iron, in solution, by its equivalent quantity of chloride of sodium; and, having separated, by known means, the resulting sulphate of soda, they add to the solution of muriate of iron, concentrated by eva-

poration,—first, enough dry sawdust, or other suitable matter, to absorb it, and then enough hydrate of lime to decompose it into chloride of calcium and precipitated oxide of iron. Coal-gas is purified with this mixture, disposed in dry purifiers; and, afterwards, sulphur, cyanogen, and muriate of ammonia, are extracted from the used materials by any ordinary processes adapted for that purpose. Sometimes the purifying material is modified in the following manner:—An equivalent quantity of ground or granulated sulphate of iron, or chloride of sodium, is mixed with the other of these salts in solution, absorbed into sawdust or other suitable matter; and then an equivalent of hydrate of lime is stirred in. This modified material, after being used in dry purifiers, for purifying coal-gas, affords, by lixiviation, a mixed solution of sulphate of soda and muriate of ammonia;—sulphur and cyanogen also may be extracted from it, as in the former case. Sometimes the sulphate of iron is replaced by sulphate of copper; and then the resulting oxide, of course, is the oxide of that metal, instead of the oxide of iron.

The patentees claim, under this head, the combination of processes, above described, for making a purifying material, containing chloride of calcium and precipitated oxide of iron or copper; and likewise the composition of the modified material, as described. They also claim the use of both kinds of materials for purifying coal-gas.

Another part of the invention consists in purifying coal-gas by means of a cheap material, made by mixing refuse sulphate of lime or gypsum, in a finely-divided state, with sulphate of iron. The sulphate of iron should be either ground fine or granulated, and mixed with sawdust, or other matter, suitable for separating its particles; or it may be merely mixed, in a divided state, with the earthy salt, or absorbed into its mass, or into sawdust, or other porous matter. The gypsum should be previously baked at a red heat, to prevent its tendency to solidify with water. The material, thus prepared, is used in dry purifiers, in the way well understood for purifying by hydrate of lime. For the sulphate of iron other metallic salts may be substituted with similar results,—such, for example, as muriate of iron, sulphate or muriate of zinc, sulphate or muriate of manganese, or even sulphate or muriate of copper; but sulphate of iron is preferred. The resulting mass is either used as a manure or else it is subjected to certain known chemical processes for obtaining from it an ammoniacal salt or salts, sulphur, and cyanogen.

The claim under this head is for the purification of coal-

gas by the use of sulphate of lime, mixed with any of the metallic salts above named; and the use of the spent purifying material as a manure.

Another improvement consists in causing impure coal-gas to pass through dry purifyers charged with a porous solid material, which is made by mixing, in about equivalent proportions, hydrated or precipitated oxide of iron with carbonate of lime, magnesia, carbonate of magnesia, or magnesian limestone, in fine powder, or else burned and slaked, either by themselves, or rendered more pervious to the gas by sawdust or other suitable matter. A mixture of precipitated oxide of iron and lime answers the same purpose, and was claimed by Mr. Laming, under a former patent. In each of the above cases oxide of copper may be substituted for the oxide of iron. All the several compounds, when they begin to act on the impure gas, purify it from sulphuretted hydrogen and cyanogen; and any one of them, having been once made foul, and afterwards placed in contact with atmospheric air for a few hours, acquires the property of purifying coal-gas from ammonia also. The spent materials afford, by processes well known, cyanogen, sulphur, and ammoniacal products.

The patentees claim, under this head, the purification of coal-gas, by mixtures made as described, whether with hydrated or precipitated oxide of iron or of copper.

Another part of the invention consists in a particular way of using chloride of magnesium, or sulphate of magnesia, for withdrawing from coal-gas ammonia and carbonic acid. Sawdust or other solid matter, calculated to expose an extensive surface to the gas, without opposing great resistance to its passage, is caused to absorb a saturated solution of one or both of the above-named salts; or those salts may be mixed, singly or together, in a divided and solid state, with sawdust or other suitable matter, in a damp state; and then the mixture is placed in dry purifiers, through which the gas is made to pass in its way from the condensers to the gas-holders. When the gas ceases to be purified from its ammonia, the contents of the purifier are taken out and washed, to obtain an ammoniacal solution; and a new charge of similar purifying materials is introduced into the purifier.

The claim made under this head is for the extraction of ammonia and carbonic acid from coal-gas, by chloride of magnesium, or sulphate of magnesia and water, diffused through sawdust or other solid matter, capable of exposing an extensive surface of the re-agents to the gas, without materially impeding its passage.

A further improvement consists in purifying coal-gas by the use of a solid material, containing chloride of magnesium or of calcium, or sulphate of magnesia, mixed with hydrated or precipitated oxide of copper. To make this purifying material, the patentees take sawdust, or other suitable matter, wetted with a strong solution of muriate or sulphate of copper, or else either of those salts of copper in a finely-divided state and mixed with moistened sawdust or other suitable matter, and they mix therewith enough lime, magnesia or its carbonate, or magnesian limestone, burned and slaked with water or powdered, to decompose the salt of copper into precipitated oxide of the metal and a salt of lime or magnesia, or both. Or, instead of making extemporaneously both or either of the salts of magnesia and lime and oxide of copper, they mix sulphate of magnesia, or chloride of magnesium or of calcium, ready formed and in a state of mechanical division, or in solution, with oxide of copper and sawdust or other suitable matter. These purifying materials are used in dry purifiers like hydrate of lime. They can be employed for removing ammonia, carbonic acid, and sulphuretted hydrogen from the gas; or they may be used for the latter impurity without the two former. In the first case it is found useful to add to them about half an equivalent of fine carbonate of lime, or of carbonate of magnesia, or of both; and in the latter case it is preferred to make either the same addition, or, in lieu thereof, to add about the same quantity of caustic lime or magnesia, or of both of them. When the used material will no longer purify the gas from sulphuretted hydrogen, either it is taken out of the purifier and exposed to the atmosphere, or else a current is directed through it while in that vessel,—a vent-hole in the purifier, below the level of the foul purifying matter, being open, or not, at the same time, as may be found necessary. The purifying energy of the material is thus restored; and this alternate expenditure and restoration of energy can be repeated a number of times, until the material becomes sufficiently charged with sulphur, and with ammoniacal and cyanogen products, or either of them, to render it worth while to extract it or them in any known way.

The patentees claim, under this head, the purifying coal-gas by the repeated use of a solid material, containing sulphate of magnesia, or chloride of magnesium, or calcium, or more than one of those re-agents, in combination with oxide of copper, and mixed or not with lime or magnesia, or both, or either, or both of the carbonates of those earths.

The next part of the invention consists in a process for

converting the ammoniacal liquor produced in making gas, or by distilling animal matters, into sulphate of ammonia. By repeatedly using the same portion of hydrated or precipitated oxide of iron or copper—in conjunction with lime, magnesia, carbonate of lime, carbonate of magnesia, or any compound of lime or magnesia susceptible, under the circumstances in which it is used, of being decomposed by carbonate of ammonia—for purifying coal-gas, with subsequent exposure to atmospheric air, the spent material eventually becomes in great part changed into sulphate of lime or sulphate of magnesia, mixed with oxide of a metal. When this has taken place, the spent material is mixed in a vat, for an hour or two, with nearly as much of the ammoniacal liquor as it will decompose; the fluid is next drawn off and filtered; the saturation of any ammonia which it may contain in a volatile state is effected by sulphuric acid; and then it is evaporated to obtain crystals of ammoniacal sulphate. The same process is followed by another good result; for the decomposition of the carbonate of ammonia by the sulphate of lime, or sulphate of magnesia, reproduces in the spent material a carbonate of the earth, which fits it for beginning anew the work of purifying coal-gas.

The patentees claim the use of the spent materials, above described, for converting solutions of carbonate of ammonia, mixed or not with hydro-sulphate of ammonia, into solutions of ammoniacal sulphate; by which use, also, the sulphate of lime or sulphate of magnesia, in the said mixtures, is changed into carbonate of lime or carbonate of magnesia.

When solid and porous mixtures, containing hydrated or precipitated oxide of iron or copper, or a salt of either of those metals decomposible into hydrosulphuret of the metal, are employed to absorb sulphuretted hydrogen from coal-gas, and are afterwards brought into contact with atmospheric air, the mixture rapidly absorbs oxygen, and thereby acquires an elevated temperature greater in proportion as it is free from moisture. In certain cases, when the materials are at first, or become by use, dry to the touch, their temperature during the subsequent absorption of oxygen rises much higher than is desirable. One way of preventing this injurious accession of heat is by communicating humidity to the mixture of materials at a proper time; and this constitutes another part of the invention. This improvement is put into practice, either by sprinkling the used purifying materials with water, on removing the cover from the vessel, which contains them; or by pipes, properly disposed within the vessel, distributing water over the surface of the materials, without the cover being re-

moved; or by sprinkling the materials with water, after they have been thrown out of the vessel; or, lastly, by placing the purifier in communication with a steam-boiler, and directing through the used materials a sufficient quantity of the vapor of water to moisten them, and subsequently submitting them to the influence of a current of atmospheric air, also directed through them. The patentees state that they know it to be necessary that the metallic oxides, used for purifying coal-gas from sulphuretted hydrogen, should be hydrated; that is to say, combined with a certain proportion of water in a dry state; but experience has proved to them, contrary to common opinion, that the said oxides act less energetically on the sulphuretted hydrogen in the gas, and also that they regain their expended energy less suddenly, when they contain water in a liquid state, than when they are free from hygrometric water.

The patentees do not claim the regeneration of the purifying energy of any spent purifying mixtures, by exposing them to atmospheric air; but what they claim is, the means, above described, for checking the rapidity of the regenerating action, and, consequently, preventing the temperature of the materials from rising to a pernicious height,—namely, by wetting them with water, or by condensing steam in their mass, either in or out of the purifier, at any time after they commence to purify the gas, and before they are put in communication with the atmosphere.

The patentees have found that mixtures containing hydrated or precipitated oxide of iron, changed into hydrosulphuret of iron by purifying coal-gas from sulphuretted hydrogen, do not readily re-absorb oxygen, and, consequently, do not readily recover their purifying energy, at temperatures below 32° Fahr.

Now, another improvement consists in applying to such used mixtures, during frosty weather, atmospheric air, artificially warmed to about 60° Fahr. by the ordinary operations of the "retort-house," or in any other convenient manner. The warmed air may be used there, or conducted thence to the purifiers, by suitable pipes, in which a draft is established by any known means.

The claim, under this head, is for the use of air, artificially warmed, for promoting, in cold weather, the regeneration of hydrated oxide of iron in mixtures which have been used for purifying coal-gas from sulphuretted hydrogen,—whether the warmed air be conveyed to the used purifying mixtures, or the latter be carried to the warm air.

Another part of the invention consists in the use of phos-

phate of lime, dissolved in hydrochloric acid, for purifying coal-gas, and for decomposing the ammoniacal liquors produced in making gas, and in the distillation of animal matters, and the application of the products as manures. In carrying out the improvement, bones, or other form of phosphate of lime, are dissolved in hydrochloric acid. This solution is prepared for purifying gas by mixing it with sawdust or other suitable solid matter; and thus it is exposed to the impure gas in dry purifiers. To use the solution for decomposing ammoniacal liquors, one of the fluids is added to the other, until the hydrosulphuric and carbonic acids combined with the ammonia have escaped. To facilitate the transport of the product, and its application as a manure, it is heated in pans until it becomes dry. The product of the purification of gas is also a good manure, mixed as it is with the sawdust or other absorbent matter used.

The patentees claim, under this head, the use of a solution of phosphate of lime in hydrochloric acid for purifying coal-gas, and for saturating ammoniacal solutions; and also the use of the products as manures.

Another part of the invention relates to certain processes for obtaining, in an economical manner, one of the re-agents which the patentees use for purifying gas,—namely, chloride of calcium. In certain chemical works, hydrochloric acid gas is a residuary product,—not only of no value, but even costly to get rid of without nuisance to the neighbourhood. One of the processes consists in causing hydrochloric acid gas to pass, in a heated state, over beds of lime, or carbonate of lime, in its way from the furnaces, where it is generated, to the condensers, where it would else become absorbed into water. The beds of lime, or carbonate of lime, are formed on the bottom of the ordinary conduits;—two conduits being arranged in a line, and worked and discharged alternately. When the lime in one passage has become converted into chloride, the draft through it is diverted into the neighbouring passage by means of dampers, arranged for that purpose; and the finished charge is withdrawn through doors made at convenient distances. When this is done, the bed is re-charged with lime or its carbonate, in readiness to receive the current of hydrochloric acid, after it shall have saturated the lime in the second conduit. When this saturation is completed, the dampers are reversed, so as to direct the acid gas again into the first conduit, while the charge of the second is being withdrawn, preparatory to re-charging it a second time; and so on continually. By the second process, hydrochloric acid is obtained

in a concentrated state, preparatory to its saturation in a fluid form by lime or its carbonate, or to its application to other uses. This process is carried on with only one conduit, leading from the furnaces where the hydrochloric acid is generated. The conduit is lined with glazed bricks, or tiles, or sand-stone; and its bottom is so constructed, that any fluid formed within it shall escape by a pipe adjusted to its lowest part. Along this conduit a number of porous earthenware vessels are arranged, in a line or lines, standing on its floor, and built into its arch or cover up to their necks. These vessels are filled with water, and made to communicate, by means of syphons, with one another, and with a reservoir of water, placed with its highest part on the same level as the mouths of the earthenware vessels. By well known arrangements the water is kept at a constant level in the reservoir, and consequently at a constant level also in the earthenware vessels which communicate with it. The consequences of this arrangement are, that the water contained in the vessels within the heated conduit is speedily raised to a temperature of 212° Fahr.,—that the gaseous contents of the conduit are reduced to that temperature or nearly so,—and that the water which exudes through the porous earthenware absorbs as much hydrochloric acid gas as it can combine with. Now as strong hydrochloric acid is condensible at a temperature above 212° Fahr., and as the vapour of water is not condensible at that temperature, the strong acid flows down the outsides of the porous vessels and runs in a stream to the most depending part of the passage, where it escapes by the pipe placed for that purpose. By treating the acid, so obtained, with lime or its carbonate, chloride of calcium or muriate of lime is obtained, with hardly any cost for evaporation.

The patentees claim, under this head, making chloride of calcium, by causing the hydrochloric acid gas, which results from the decomposition of common salt by sulphuric acid, to act on lime or carbonate of lime in its passage from the furnace where the decomposition is effected; and also the collecting of concentrated hydrochloric acid, for making chloride of calcium or other purposes, by condensing hydrochloric acid gas in water by means of earthen vessels, built into a conduit or flue conducting from furnaces in which chloride of sodium is decomposed by sulphuric acid, and containing water kept at about 212° Fahr. by the heated products of the said furnaces.

The next part of the invention is a new way of using certain forms of carbon for purifying coal-gas and obtaining

ammonia therefrom. It consists in causing the material alternately to absorb impurities from the gas, and to discharge them under the influence either of heat or of a current of air or steam directed through the purifying material. In carrying out this improvement, a dry lime purifier, or other convenient vessel, is filled with animal charcoal in coarse powder, and impure coal-gas is directed through it, until it no longer issues from the vessel pure. The gas is then sent in another direction, and a current of steam or air, heated or otherwise, is passed through the foul material;—the volatile products being received into any desirable acid or other substance calculated to fix the ammonia, or else the ammonia, combined with carbonic and hydrosulphuric acids, is condensed by water, or by the abstracting of heat, in any suitable apparatus. If steam be used, it brings away nearly the whole of the ammonia, but it damps the purifying material, which then needs to be dried by a current of hot air or otherwise; and if air be used, in the first instance, to bring away the ammonia, part of it becomes sulphate of that base, and must be removed by washing. In addition to or without the introduction of air or steam among the purifying material, it may be heated by steam or hot water, contained in a jacket around the vessel or in pipes within it; or the foul material may be removed from the purifier and heated to about 212° Fahr., in any suitable close vessel. Coke, wood, charcoal, or peat-charcoal may be substituted for animal charcoal, in the process above described, but with inferior results.

The patentees do not claim the exclusive use of any form of carbon for absorbing the impurities of coal-gas;—their claim being for the means above described for making coke and charcoal repeatedly useful for purifying coal-gas, and for obtaining its ammonia by their agency.

Another part of the invention consists of certain processes by which prussiate of potash, prussiate of soda, and prussiate of ammonia are obtained from prussiate of lime. With respect to prussiate of potash, the process is to mix well together equivalent quantities of prussiate of lime and sulphate of potash or carbonate of potash, previously dissolved in separate portions of water; and then, after subsidence of the sulphate or carbonate of lime which is formed, to evaporate and crystallize the clear solution. The prussiates of soda and of ammonia are made in like manner, by substituting the sulphates or carbonates of the respective bases for the sulphate or carbonate of potash.

The claim, under this head, is for the manufacture of the

prussiates of potash, soda, and ammonia, by decomposing solutions of the sulphates or carbonates of those bases by solutions of prussiate of lime.

Another improvement consists in a process for obtaining carbonic acid gas, for converting the hydrosulphate of ammonia, in gas liquor, into carbonate of ammonia, and for other useful purposes to which carbonic acid is applicable. It is known that hydrosulphate of ammonia is decomposible by carbonic acid, and that hydrosulphate of ammonia exists in gas-liquor. To change it into carbonate of ammonia, the patentees proceed as follows:—They make a mixture of deutoxide of copper and charcoal, or other form of carbon, in fine powder, in the proportion of twelve parts, by weight, of the former to one part of the latter, and introduce the mixture into a retort, made red hot, and furnished with an eduction-pipe, which passes through cold water, and finally enters into gas-liquor. The formation of carbonic acid gas soon takes place, by the union of the carbon with the oxygen of the metal; and this gas, combining with the base of the hydrosulphate of ammonia, combined in the gas-liquor, converts it into carbonate, causing hydrosulphuric acid to escape. When the carbonic acid gas ceases to come away, nearly all the carbon will have disappeared from the retort, and the copper, which it contains, become reduced to the metallic state. The charge is then drawn and left to cool, while a second charge, of similar materials, is being worked off; during which time the copper re-absorbs oxygen from the air, and becomes again deutoxide of copper, which may then be used anew with fresh carbon.

The patentees claim making carbonic acid gas, for converting hydrosulphate of ammonia into carbonate of ammonia, and for all other purposes in the arts, by exposing a proper mixture of deutoxide of copper and carbon, in powder, to a red heat in suitable vessels.

The last part of this invention is a process for consolidating peat, to be used in furnishing gas, or charcoal, or for fuel. The process is as follows:—The peat, without being previously dried, is treated with water in a mill, in a way similar to that in which chalk is treated for the manufacture of whitening, and which is well understood. The resulting liquor is made to pass through a strainer of wire-work (fine enough to prevent the passage of the large fibres) into tanks or backs, cut in the earth or built upon the surface of the ground, if necessary,—where it is left to deposit the finer parts of the peat. When this is effected, the supernatant

liquor is run off from the deposit, and the magma taken out from the tanks or backs and dried, either by the air, by the sun, or on arches of brick or other absorbent material, heated by flues underneath.

The patentees claim, under this head, the separation of the grosser from the finer parts of peat, and the consolidation of the latter by the process above described.—[*Inrolled October*, 1850.]

To William Sykes, *of York-street, in the county of Middlesex, tallow-chandler, for certain improvements in the manufacture of candles and wicks.*—[Sealed 23rd March, 1850.]

This invention consists, firstly, in certain methods of manufacturing dipped candles partly of tallow and partly of stearic acid. The tallow and stearic acid are kept in a melted state in separate vessels, and the candles are formed by dipping into each alternately;—a suitable time being suffered to elapse between the dipping operations, to admit of each coat becoming sufficiently hard before the next coating is applied. Or, instead of dipping into the tallow and stearic acid alternately, the wicks may be dipped into the tallow until they have become coated therewith to the desired thickness, and the candles may then be finished by dipping in the stearic acid. Or the tallow and stearic acid may be melted together, in suitable proportions, and the candles made therefrom by dipping in the same manner as when manufacturing dipped candles from tallow alone.

The second part of the invention consists in coating dipped candles, and such other candles as are made wholly or partially of tallow, with a compound of borax and bismuth, in order to improve the appearance thereof. The candles are made, in the ordinary manner, of tallow, or a mixture of tallow and stearic acid, or other suitable materials; and then they are dipped into a finishing bath, composed of borax and white oxide of bismuth, dissolved in or combined with a portion of the tallow or other materials of which the candles are made.

The third part of the invention consists in impregnating the wicks of dipped candles (whether plaited or plain), before dipping, with a solution of borax, or a solution of bismuth, or of a compound of borax and bismuth,—the object being to cause the wicks to be consumed without requiring to be

snuffed from time to time. The wicks are dipped into a solution of borax in water, or a solution of bismuth in nitric or other suitable acid, or a solution of bismuth or oxide of bismuth and a small quantity, say three-tenths, of a solution of borax; and after this the wicks are dried and then used in the manufacture of candles.

The last part of the invention consists in an improved apparatus for suspending and cutting wicks for making dipped candles. In Plate XV., fig. 1, is a transverse vertical section, and fig. 2, a plan view of the apparatus. *a,* is the framing of the apparatus. *b,* is a grooved roller, mounted in bearings at the upper part of the framing, and over it the cords of twisted or plaited cotton pass from the bobbins *c,* to the clip or holder *d.* This clip or holder is shewn separately, on an enlarged scale, at fig. 3: it consists of two bars d, d^1, held together by sliding clamps *e*; the ends of the bar *d,* are wedge-shaped, and are acted on by two small springs, which tend to force this bar away from the other; but the two bars are caused to approach each other, and nip the cotton cords, by sliding the clamps towards the centre of the bars. *f,* is the moveable blade, and f^1, is the fixed blade of the shears or scissors by which the cotton cords are cut. *g,* is a trough for containing a liquid cement, composed of stearic acid, wax, tallow, or any other suitable ingredient, which is kept in a melted state by the admission of hot water, hot air, or steam, into the jacket that encloses the trough. *h,* is a table that supports the broach or rod *i,* by which the wicks are suspended during the process of dipping, and which is made square, instead of being round, as usual.

The following is the mode of using the apparatus:—The cotton cords are conducted from the bobbins over the roller *b,* and secured between the bars of the cliff *d*;—each cord projecting about an inch beyond the front edge of the clip. The clip is then drawn forward, and the projecting ends of the cords are immersed in or brushed over with the cement in the trough *g,* and then laid on the upper side of the rod *i,* to which they are made to adhere (by a slight pressure) with sufficient firmness for the dipping operation. The cords are now released from the pressure of the clip, by sliding the clamps outwards; the clip is moved back over the cords to a distance corresponding with the intended lengths of wick; and then it is again caused to nip the cords (by moving the clamps), and is placed about an inch behind the shears. The moveable blade of the shears is now brought down and cuts

off the lengths of cottons, which are adhering to the rod *i*; and this rod, with the wicks, is then removed to an ordinary dipping frame. A fresh rod is now placed on the table *h*, and the operation proceeds as before. If preferred, the two bars *d*, d^1, of the clip may be hinged together, as shewn at fig. 4,—so that when closed, they will hold the cotton cords, and when opened, they will release the same.

The patentee claims, First,—the manufacture of dipped candles partly of tallow and partly of stearic acid, according to the several modes above described. Secondly,—the coating externally of dipped candles, and such other candles as are made in whole or in part of tallow, with a compound of bismuth and borax as before described. Thirdly,—the impregnating of wicks of dipped candles (whether plaited or plain), before dipping, with a solution of borax, or a solution of bismuth, or a compound of bismuth and borax, each in lieu of the others, as before described. Fourthly,—the improved apparatus or machine for suspending and cutting wicks, and method of using the same, before described: that is to say, in so far as regards the square form given to the suspending broach or rod; the cementing of the wicks at one end to the broach; the peculiar construction of the clip; and the combination therewith of arrangements for cutting the wicks.—[*Inrolled September*, 1850.]

Scientific Notices.

PEAT-CHARCOAL A SUBSTITUTE FOR ANIMAL-CHARCOAL, AS A DECOLORIZER OF VEGETABLE SOLUTIONS, &c.

The attention of practical men has been, of late years, so much directed to the manufacture of peat, with the object of converting it to some useful and profitable end, that the nature of the substance itself, and of the different products obtainable from it by destructive distillation (which forms the foundation of every process for the manufacture of peat), is now well and generally known; and, although out of the imaginations and hopes of enthusiastic men, have arisen numerous, somewhat ill-founded, speculations upon the ultimate importance of the part peat is destined to perform, in relation to the industrial world, a sober view of the subject is quite sufficient to prove, that peat is a most valuable substance, ca-

pable of rendering up to the hands of the manufacturer many compounds highly useful in the arts.

Among the other results of the distillation of peat is one upon which much has been written and said with reference to its superiority over an article of a similar character, obtained from other sources—this is the charcoal or coke left in the retort after all the volatile constituents of the peat have been distilled away. Experience shews this coke to be a substance of great value as a fuel, besides being useful as a disinfectant or antiseptic, and as a carbonaceous manure. In a former number of this Journal, a paper appeared detailing the particular properties and advantages of this description of coke, in relation to metallurgy and other arts; it is, therefore, unnecessary to go again into this subject, as the intention now is, to point out an additional peculiarity of peat-coke, which may, perhaps, prove to be its most valuable quality: this is, the property which it possesses, in common with the charcoal procured by the carbonization of bones or blood, or indeed any animal matter—to deprive colored vegetable solutions of the whole of their coloring matter. This is a very remarkable property, which some kinds of charcoal have long been known to possess, although it is not quite peculiar to charcoal;—alumina, in a certain condition, and some inorganic compounds, being capable of exercising the same action upon certain coloring principles. As the character of the decolorizing effect, produced by charcoal, may not be generally known, it may be stated, that, if a quantity of port wine, solution of indigo, cochineal, logwood, or any similar colored fluid, be passed through a little bone-charcoal, placed upon a filter, during its passage through the charcoal, the whole of its color will be abstracted, and retained unaltered by the carbon; whilst the fluid will pass through quite colorless. This power of charcoal to remove color from vegetable extracts or infusions, is one which has received a most important and valuable application in the manufactures, particularly in the sugar manufacture. In the production of refined or white sugar, as it is termed, the solution of the coarse brown sugar, or muscovado, is deprived of its coloring matter, by being passed through large filters of animal-charcoal. This brown sugar contains, as its name indicates, a large quantity of color, and, when dissolved in water, gives a liquid of a very deep brown hue; which, in passing through the charcoal, may be deprived of the whole of its color, and become as limpid and colorless as water: in practice, however, it is only found necessary to abstract a portion of the color.

These remarks suffice to shew what is meant when the decolorizing power of charcoal is spoken of, and the nature of the application of that property to practically useful purposes; and it is the circumstance of peat charcoal possessing the same decolorizing power, which is now intended to be brought forward.

It does not appear that the property of peat charcoal or coke to abstract coloring matter from its solution, has been before observed; or, at least, no account of it has been hitherto published. Some time since, being engaged in a series of experiments, having for their object the determination of the character and quantity of the compounds obtained by the destructive distillation of peat, the writer was struck with the peculiar physical character of the charcoal, and with its resemblance, in many respects, to that obtained from bones or other animal matter; and it occurred to him to try its effect as a decolorizing agent. The disinfectant properties of this charcoal were already well known; but the antiseptic and decolorizing power of charcoal bear no kind of relation to each other; and, therefore, although peat charcoal was known as a good disinfectant, it did not at all follow that it should be capable of removing, or, more properly, attracting vegetable and animal coloring matters from their solutions. For example, wood charcoal is antiseptic, probably as much so as animal charcoal, but its decolorizing power is extremely slight. To return, however, to the charcoal from peat:—having been, as has been said, struck with the peculiar appearance of some charcoal produced in one of the experiments upon peat, it was thought desirable to try whether it possessed any decolorizing power. The charcoal was therefore reduced to the state of powder, washed with water only, and a portion of the washed charcoal was added to some port wine. The mixture was well stirred up for about a minute, and then thrown upon a filter: the fluid immediately began to pass through the filter, almost entirely deprived of its color. This experiment was repeated with colored solutions of different kinds, and always with a similar result; so that the decolorizing power of the charcoal was proved not to depend upon an accidental circumstance, but to be a specific property of this kind of charcoal, as it is of that from animal matter. Among other colored solutions used in the first experiments, were port wine, infusions of cochineal and logwood, and sulphate of indigo:—all these were deprived of their color immediately and with certainty,—the

aqueous portion passing through the filter quite limpid and colorless.

After having tried solutions such as the above, all of which render up their coloring matter with great facility to animal-charcoal, it appeared desirable to ascertain whether this property of peat-charcoal possessed any practical value,—that is to say, whether it was capable of producing the same bleaching effect upon saccharine fluids as is produced, in the manufacture of sugar, by bone or other animal-charcoal. Its effect was, therefore, next tried upon solutions of common muscovado sugar, of different strengths; and the result of these experiments was quite sufficient to set at rest the question,—proving that peat-charcoal possessed, in a remarkable degree, the valuable property of decolorizing colored animal and vegetable infusions or solutions. The colored saccharine fluids were rendered perfectly colorless; and, upon evaporation, yielded crystals of pure white sugar. In some instances, the fluid was filtered at once through the charcoal; in others, the charcoal was mixed with the heated solution, and the whole thrown upon a filter,—always, however, with the same effect; the fluid being, in every case, where the manipulation was carefully conducted, deprived of its coloring matter. Up to this time, no trials had been made with reference to the comparative decolorizing power of the peat-charcoal,—taking the best "bone-black" as a standard. Before it could be said, therefore, that peat-charcoal could be used in the arts or manufactures as a decolorizing agent, its comparative power was to be ascertained. Some experiments were next entered into with the object of deciding this point; and the result shewed the decolorizing effect of peat-charcoal to be to that of "bone-black" in the proportion of about 5 to 4,—that is to say, four parts of bone-black were capable of effecting an amount of bleaching equal to that obtainable from five parts of peat-charcoal. This is a very important point; for, if it had been found that it required double or treble the quantity of peat-charcoal, compared with animal-charcoal, to produce the effect, its decolorizing power would be useless;—for, under those circumstances, the practical difficulties would be so much increased, that, although the price may not be one-fourth so great, the increase of the mass of matter to be dealt with, and the loss in material absorbed and retained in the filtering substance, would prove an insuperable objection to its employment: this objection does not, however, appear to exist. It is certainly necessary that at least 25 per cent. more peat-

charcoal should be employed; but the price not being more than one-sixth that of bone-black, the increase of quantity of material and accruing loss seem to be much more than balanced; indeed, to leave a large margin in favor of peat.

This decolorizing effect of charcoal is supposed to depend upon what is termed surface-action, and not upon any chemical property;—one thing is certain, the coloring matter does not become changed, as under the influence of chlorine, or other chemical bleaching agents, but seems to be merely retained, and can be afterwards extracted from the charcoal by chemical treatment. The probable reason of peat-charcoal possessing this property is, its extremely porous character, which arises from the large proportion of earthy matter it contains: this ordinarily amounts to from 8 to 12 per cent.; but it is sometimes even much greater. From the presence of this earthy matter, the particles of carbon may be supposed to be separated and isolated, so that their whole surface is rendered available to the kind of attraction upon which this decolorizing power seems to depend.

In trying the decolorizing effect of peat-charcoal, it must be borne in mind, that peat contains, among its inorganic constituents, iron and sulphate of lime (which, in burning, is converted into sulphuret of calcium). Before using the charcoal, therefore, it ought to be well washed with hydrochloric acid, to remove these and any alkaline matters which may be present, as the alkalies impart a yellow color to syrup; and the iron entering it, in the state of protoxide, becomes converted into peroxide during its evaporation, and imparts a reddish color to it, and to the crystals of sugar.*

T. W. K.

ORDER OF THE ATTORNEY-GENERAL RESPECTING PATENTS FOR INVENTION.

It has long been a reproach to our system of granting patents that (to use the words of the writer of the Tract upon the Patent Laws, issued by the Financial Reform Association) "No description of an invention, sought to be protected by patent, is ever required by the law officers of the Crown; nor is any enquiry instituted, except in cases of opposition, to enable them to judge

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* The experiments were made upon many different varieties of peat from totally different districts.

whether letters patent should be granted or withheld from the applicant." By a recent order however of the Attorney-General (a copy of which is given below), it will be seen, that this anomaly is removed; and we trust that—as, in the present holder of the responsible office of chief law adviser to the Crown, we have a gentleman who has at once proved his willingness to relinquish the emoluments and, for the better security of patentees, to add to the duties of his office—it will not be long before the desire, which is now becoming more general among inventors, for a thorough reform of our patent laws, will be met by a careful and judicious legislative enactment on the subject. The following is a copy of the order referred to:—

"The Attorney-General, with the assent and concurrence of the Solicitor-General, hereby gives notice, that every person applying for a patent after the 2nd day of November instant, will be required to deposit, in the Office of the Attorney-General or Solicitor-General, an outline description, in writing or drawing, to be approved by the Attorney-General or Solicitor-General, before any report will be made on such patent."

2nd November, 1850.
Lincoln's-inn. (Signed) JOHN ROMILLY.

INSTITUTION OF CIVIL ENGINEERS,

November 12th, 1850.

(Being the First Meeting of the Session.)

WILLIAM CUBITT, Esq., President,—in the Chair.

The proceedings of the evening commenced with the announcement of the dates of the ordinary Meetings of the Session; the appointment of December 17th, for the Annual General Meeting, for the election of the President, Council, and Officers; and of the 27th May, 1851, for the President's conversazione.

The paper read was "*A comparative view of the recorded explosions in coal mines,*" by Mr. William West, of Leeds, Assoc. Inst. C.E.

The Reports of Faraday, Lyell, De la Beche, Playfair, and others, were carefully analyzed and tabulated; from which it appeared, that tendencies towards a dangerous condition existed in mines reputed to be comparatively safe, and that these tendencies were so numerous, and varied so suddenly in their nature and extent, as to necessitate attention to every kind of precaution.

The proposed appointment, by the government, of inspectors of mines, was noticed, not with the intention of shewing that their supervision would diminish the responsibility of the mining engineers and overmen, but of demonstrating, that by establishing more constant communication between the various districts, they might induce the general adoption of those measures of precaution which were found in certain mines to be so efficacious in averting accidents, or in affording means of safety when they did occur.

The different depths of mines, varying from seventy-five yards at Darley, to three hundred yards at Haswell, did not appear to have any influence on the accidents The tendency to the emission of carburetted hydrogen gas from certain seams, would have appeared a more rational reason, though the records did not appear to bear out that theory, as mines receiving a tolerable character, had been the scene of repeated explosions; for instance, the Jarrow Mine, where, although reported "to be not very fiery," there had been six explosions in the course of twenty-eight years, and one hundred and forty persons had been killed.

The compatibility of general good ventilation, with the occasional occurrence of the most fatal explosions, was particularly dwelt on. The witnesses on the inquests after the Haswell and the Jarrow accidents, agreed that the "ventilation was perfect," "the pit full of air," and "the air quite good, and plenty of it." The fault, then, did not lie in the quantity of air, but rather in the difficulty of directing it so generally throughout all parts of the mine, as to sweep away the gas as it was produced. The "splits" for the air were noticed, and the condition of the goaf, the pockets of gas formed in the roof, and the sudden irruptions from the occasional falls in the goaf and old stalls, were dwelt on at great length; and, combined with the injudicious use of unprotected lights, and the liability of accident to the lamps, were shewn to have been the probable cause of all the explosions. The miners' lamps were passed over somewhat too cursorily, as at the present moment, when so much has been done for their improvement, that part of the subject might have been descanted on with advantage.

The precautions for saving life on the occurrence of accidents, such as abolishing bratticed shafts, and sinking a pair at each mine, at such distances apart as should insure one remaining intact, in case of an explosion injuring the other; the "scaling off" of a portion of the fresh air for the exhausting furnace, and conducting the return air into the upcast shaft at some height above the fire; together with several minor details for insuring the constant working of the exhausting apparatus, to draw off the fatal "after-damp, or choke damp," were strongly insisted on.

The rashness and carelessness of the miners was instanced with regret; but it was shewn that by education and good example, their better qualities must be brought out, and that then, the best safeguard against accident would be the instinctive love of life,

and a knowledge of impending danger from the infringement of any of the precautionary regulations established in the mines. The improvement of the workmen was, therefore, strongly insisted on, as more real benefit would probably result from such measures, than from the appointment of a host of government inspectors.

The paper was illustrated by large diagrams of the author's views of the forms of "goaf hollows" and goaf basons," as well as by several plans of mines, &c.

NOVEMBER 19TH, 1850.

The subject of the paper read was "*The ventilation of collieries, theoretically and practically considered,*" by Mr. WILLIAM PRICE STRUVE, of Swansea, M. Inst. C. E.

The author commenced by shewing that the general principles which ought to govern tbe ventilation of collieries, were—

1st. That a current of air through the channels of collieries, at a velocity of five feet per second, was sufficient for most purposes.

2nd. That a current exceeding that velocity would only be attained at the expense of leakage and other evils.

3rd. That in order to obtain the requisite supply of fresh air, the channels of a colliery or mine ought to be enlarged, according to the exigency.

In the process of laying out a mine, a subdivision occurred by which the workings were apportioned into numerous compartments, which facilitated the system of splitting the current of air, or diverting it into numerous channels, giving to each compartment a separate and, therefore, more effective ventilating force; at the same time the area of the channel was enlarged, and the aggregate length of the air tube shortened, so that it was quite practicable to pass through the workings of a mine, three hundred cubic feet of air per minute for each man employed.

The velocity of the air current in a mine was so easily affected, that it was important to consider by what accidents, and under what circumstances, any changes took place.

It could not be supposed that the excavated space of old workings was completely filled by the "falls" of the roof and "creeps" of the floor; extensive rupture of the stratification occurred, and through this broken ground great leakage must take place. This would seriously affect a long continuous air course; therefore, the way to meet this difficulty was to split, shorten, and enlarge the air channel. The details of two experiments at the Eaglesbush and Ynis's David Collieries, where the air was pumped out by Mr. Struvé's mine ventilator, shewed that a large proportion of the air was drawn from the old workings, and the "goaf" or broken ground surrounding the colliery, and did not come down the intake shaft, and traverse the actual workings, as it ought to have done.

In both these cases, the enlarging and splitting of the air channels, so as to reduce the velocity of the air to about three feet or four feet per second, would have produced most beneficial results.

These principles were shewn to have been lost sight of in the majority even of the great collieries; and the power of rarefaction by a furnace, was trusted to for dragging the long column of air over and through innumerable impediments. In some cases this was left to be produced by the increased temperature of the mine from the candles, and the respiration of the men, aided by the cooling effect of water trickling down the intake shaft, These scarcely sufficed to produce an average difference between the two shafts of thirteen degrees in winter; whilst in the summer, and in certain states of the atmosphere, there was no difference at all, and, consequently, little or no ventilation. Where rarefaction by heat was used, the temperature in the upcast shaft varied from ninety degrees to one hundred and sixty degrees; this, however advantageous for ventilation, was injurious to the shaft itself, and absolutely dangerous to the men who had to traverse it.

A comparison of the dimensions of the air passages and the velocities of the currents in numerous collieries, led to an estimate of the motive power required to produce the results attained in the best ventilated mines, in case of the employment of a steam-engine and air-pumps. This power would have varied between 23 horse-power and 26 horse-power.

The efficiency of furnace ventilation was always increased by the depth of the shafts, especially if they were entirely devoted for the purposes of ventilation, irrespective of the working of the pit.

The experiments of Mr. Nicholas Wood, Mr. G. Elliott, Mr. H. Vivian, and other mining engineers, were then quoted, to demonstrate the insufficiency of the "steam-jet," as a means of promoting ventilation; shewing that it was a most wasteful application of power, when compared with the steam force employed to work Struvé's mine ventilator at the Eaglesbush colliery. This apparatus consisted of two hollow pistons, resembling large gasometers, plunging into cisterns of water, and having inlet and outlet valves. The pistons received alternate motion from a small steam-engine of 5 horse-power; and being filled and emptied at each revolution of the crank, produced a regularity of current and a degree of copious ventilation hitherto unknown in the mines to which they had been applied. The small cost of their establishment—only about one hundred pounds for an extensive mine—joined with the little liability to getting out of order, was much in their favor.

The paper terminated with copious extracts from the able mining reports of Mr. John Phillips and Mr. Kenyon Blackwell, confirming all the positions assumed by the author.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

J. E. M'CONNELL, Esq., Vice-President,—in the Chair.

October 23*rd*, 1850.

After the nomination of the Council and Officers for the next succeeding year, the Secretary read the following supplementary paper, by Mr. Thomas Thorneycroft, of Wolverhampton :—

On the form of railway axles.

Since the reading of the paper on the form of railway axles,* the author has had his attention specially directed to some of those points which it was the object of the paper to introduce and support.

In that paper, as well as in others on the same subject, a parallel had been drawn between the railway axle and the girder, as being somewhat alike in principle: admitting the correctness of this opinion, the question would arise, why is the principle upon which every girder is made departed from in the case of the axle? If it is pleaded, that the close proximity of the prop and load, and these acting at the extreme ends of the axle, has justified this departure from the girder principle, then it might be expected that girders, loaded under very similar circumstances, would, in like manner, be reduced in the middle; but it is not so. As a case in point,—reference might be made to the girders which suspended those parts of the Britannia tubes which pass through the towers, where the prop and load are at the extreme ends of the girder, and within a few inches of each other; yet these girders are parallel, although for a distance, equal to the width of the tube, there is no load whatever.

The principal reason which has been assigned for reducing axles in the middle is, the supposition, that when parallel, the effect of the forces from lateral and vertical percussion tends to break the axle behind the wheel;—that being the point where the greatest amount of fractures have taken place: the author is, however, of opinion, that the simple and only cause of the fracture of axles, at that particular point, is the shoulder, which it has been the practice to leave on the axle as a stop to the wheel. Some of the experiments now before the Institution prove, at least, that where a shoulder exists, the strength of the axle is reduced more than one-half; which affords presumptive proof that there are other causes in constant operation (beside the arrestment of the wave of vibration) inducing fracture at that particular point.

It has now become the opinion of some engineers, that in every case of collision or other derangements of a train when in

* For report of this paper see p. 210 of the present Volume.

motion, that axles reduced smaller in the middle are unable to keep their form, and that such axles, exposed to violent lateral blows, are easily sent beyond the limit of their elasticity: the consequence is, the wheels leave the rails and contribute directly to greater damage than would ensue were the train to keep the line.

A short time ago some disarrangement of a train took place on the Shrewsbury and Birmingham Railway, in which case three or four carriages were nearly broken to pieces: the axles of these carriages were all reduced in the middle, and nearly all of them were more or less bent; while some of the carriages in the same train, with parallel axles, suffered little or no damage; and there was not one parallel axle bent in the slightest degree. Such a result might have been anticipated, when it is remembered, that the resistance which the middle of an axle offers to a bending force is as the cube of its diameter. Hence, if we take the diameter of the centre of a reduced axle at $2\frac{5}{8}$ inches, the cube of which is 18·08, and then take the diameter of a parallel axle of the same weight, which would be $3\frac{1}{4}$ inches, the cube of which is 34·32, we find that, with the same quantity of material, the parallel axle has the advantage of the reduced one, to resist all the forces to which axles are subject, by 90 per cent. So early as 1842, the Mechanical Section of the British Association had the subject of the fracture of railway axles fully discussed: after a number of excellent remarks by Mr. Nasmyth on the different causes which tended to destroy the fibre of iron and render it brittle, he observed that simply nicking iron, to the extent of only $\frac{1}{100}$th of the area, took away $\frac{1}{10}$th of its strength. Mr. Fairbairn, at the same time, expressed his opinion, that the two chief causes of the breakage of railway axles were bending and percussion: these changed the fibrous to the crystalline structure. In a paper read by Mr. J. O. York, before the Institution of Civil Engineers, in 1843, reference was made to the fleeting bars used as levers for turning the large screws for forcing forward the shield in the Thames Tunnel; that they never lasted longer than three or four weeks, although very strong, and made from the best materials; and that when fracture took place, they exhibited a bright crystallized appearance;—clearly shewing that oft repeated bending, without any concussion, had destroyed the fibre of the iron, and rendered it quite brittle.

A mass of evidence might be adduced to prove that the internal structure of iron undergoes no change, unless there be a change of form; and that simple jarring or vibration will not destroy the fibre of iron; whereas bending, if long continued, will change the most fibrous iron into crystalline; therefore the author would fully subscribe to the opinion of one of the railway commissioners, who has stated, "that it was of importance to avoid deflection on railway axles, as deflection was almost as fatal as fracture in causing accidents."

Mr. Thorneycroft gave an explanation of the experiments which he had laid before the preceding meeting, and the specimen axles exhibited on the table. Supposing that an axle bent in the centre, it must have a tendency to throw the wheels off the line; and as every time it turned round it would bend backwards and forwards, if it were bent more than the point of elasticity, it would have a tendency to snap off at the point where it was firmly fixed. If the axle were bent beyond its elastic limit, it would take a set, and would not completely go back again; and, consequently, as the bending would alter the shape, as there was a constant action going on, it would have a tendency to produce permanent injury of the iron, and in time it would break off short; because, whenever there was an alteration from the fibrous into the crystalline state, it would snap off at the point where it was rigidly fixed, namely—at the inside part of the wheels. The object was to get at the best form of axle possible, and to shew that there might be improvements in the generality of axles at present used. Axles had generally been reduced in the middle, but the experiments appeared to shew that in point of security great advantages would be gained by making the axle parallel all the way along, instead of reduced in the middle; since the latter were found very frequently to snap close to the wheels.

Mr. Bowman expressed his opinion, that it was unphilosophical and unmechanical either to reduce axles in the middle, or to make a shoulder behind the wheel. He considered the reduction of an axle in the middle must have a tendency to reduce its strength; and that, by taking away the shoulder from behind the wheel, the principal cause of fracture at that point would be removed.

Mr. Slate fully agreed with the view expressed as to the removal of the shoulder behind the wheel; but if the illustration given in the paper, derived from the girder, suggested any thing, he thought it was like strengthening a girder in the middle when it proved weak at the ends. When a strain was put on the flange of the wheel, the point of fracture would be behind the wheel; but if there were any analogy between the cases of the axle and the girder, it would tend to shew that the axle would break in the middle. The proposition brought forward was, that if the axle were made so stiff that there was no vibration, it would not be so liable to break behind the wheel; but he did not conceive that any addition of strength in the centre would produce strength behind the wheel. Indeed, where the elastic action was the greatest, the fracture would take place; and by making the axle stronger in the middle, the elastic action would be greatest at the wheel, and the liability to fracture at that point would be increased; because the flexibility would be confined to the part at the wheel, instead of being diffused over the whole axle.

Mr. T. Thorneycroft remarked, that the girders alluded to were parallel all the way along, and they supported the whole weight of the tube from the two extreme ends. Such, also, was the case with the axle, which supported the weight,—not in the middle, but at both ends.

Mr. Peacock remarked, that the material must be taken into account, because the girder alluded to was of cast-iron; and if it had been reduced in the centre, the strength might have been injured before it left the foundry, by unequal contraction; but in the case of the axles, being of wrought-iron, there was a great difference.

Mr. Slate remarked, that if the girder were reduced in the centre it would be liable to be broken there by vibration. If there was any analogy, the axle also would break in the centre; but that was not the fact.

Mr. Bowman said, that axles broke in the centre; two or three cases had come to his knowledge, though he had not much experience on railways.

The Chairman observed that, as it was an important point, he should like to elicit from such members as had experience, what number of axles they had seen broken in the centre.

Mr. H. Wright said he had never seen one that he was aware of. Mr. Ramsbottom had frequently seen axles broken near the end; but had not met with a single case of an axle breaking in the centre. Mr. Peacock concurred with the preceding speaker. Mr. Allan said he had seen a leading engine-axle broken within a few inches of the centre; but for that one he had seen probably 500 axles broken at the wheel. Mr. Owen had seen some thousands of broken axles; but he was not aware, through many years experience, of one axle breaking directly in the middle. Mr. Henson had never seen one break in the middle; and thought that many thousands broke at the wheel compared to one at the middle.

The Chairman said, the result of his experience fully agreed with the preceding observations, that it was very rare for axles to break in the centre.

Mr. T. Thorneycroft inquired whether any member had seen any of the parallel axles broken close by the nave of the wheel? To which Mr. Henson replied, that he had seen a large proportion of them so broken;—some of these had very slight shoulders; the others larger ones.

Mr. Cowper said, it seemed to him that Mr. Thorneycroft's conclusions were arrived at by experiment, unaided by theory. In fig. 1, Plate XV., if they took *a*, *b*, as the axis of a railway axle, *a*, and *b*, as the centres of the journals, and *c*, as the centre of one wheel, they would have the case of a girder weighted at *a*, and *b*, and supported at *c*: the proportionate strength ought, therefore, to be as a triangle *a*, *c*, *d*, and a triangle *b*, *c*, *d*. Now, if they put two of these triangles together, as at *e*, *e*, they would at once arrive at the result, that the strength of the axle should

be uniform between the wheels, and, consequently, parallel; and from the wheels to the journals the strength should be as a triangle; and, if they had merely to do with a strain due to the weight on the journals of the axle, these proportionate strengths would be strictly correct. But they had another enemy to deal with—they had to provide against the lateral strains, from the flanges of the wheels suddenly striking the switches and crossings in passing through them; and this was so much greater than the mere weight on the axle, that it must be considered chiefly in determining the form of an axle. If, therefore, the figure *a, c, b, d,* were reversed on itself, the outline thus given would represent the proportionate strength of an axle, as at *f, f,* which was fully in accordance with the usual tapered form of axles. The actual diameters could, of course, be easily arrived at, by taking the cube root of the width;—as it was well known the strength of solid cylinders are as the cubes of their diameters.

Mr. Shipton observed, that experience shewed that an axle should be a rigid body; hence he understood the idea of the writer of the paper to be—that elasticity in the centre tended to ultimate fracture.

Mr. Bowman said, the parallel axle was adopted to do away with the deflection. In the cases of parallel axles referred to as being broken, there were shoulders behind the wheel; but what they wanted to find was an instance of a parallel axle, without a shoulder, being broken.

Mr. Slate observed, that he had suggested the introduction of a small shoulder inside the boss of the wheel, near the outer side (see *a*, fig. 2,), which he thought would have all the advantage of the shoulder at the inner side of the boss, without weakening the axle at all. The wheel was to be bored out a tight fit, and forced on to the axle by a press; but the first $1\frac{1}{2}$ inch from the inner side was to be slightly coned, as shewn at *b*, so as to remove the grip on the axle from the extreme edge of the boss, and prevent the tendency for the axle to break at that point.

The Chairman said, they had found, a considerable time ago, that in the use of the square shoulder there was a great liability to cause fracture; hence they adopted the present form, which is countersunk into the wheel, from the inner edge of the boss, with as small a taper as possible: the difference of the axle in its rough state and when turned true being sufficient for the purpose,—bevilled off into the wheel, as the wheel-boss was bored accurately, and forced on tight by a hydraulic press. The shoulder was thus entirely avoided.

Mr. Middleton observed, that he had proposed some time ago that a cone of about one-third the length should be carried into the boss of the wheel, or rather a large hollow; and in turning up the axle he would leave no shoulder at all.

Mr. Williams said, there was no doubt a parallel axle would be the stiffest; but the question was, whether it was the most efficient.

If a bar of iron was repeatedly bent backwards and forwards in the middle, it would certainly become crystalline, and would break in the centre; but axles did not break in the centre; hence the illustration did not hold good.

Mr. Cowper remarked, that a parallel axle or bar of iron, fixed near one end in a vice, and worked about at the other end, would break at the vice, no doubt, like the axles breaking at the point where they are fixed in the boss of the wheel; but he could conceive the possibility of it being reduced from that point to the other end in such a taper that they could not tell where it would break, and it would be equally strong throughout.

Mr. H. Smith said, whether the shoulder were square or not, he was of opinion that axles were more liable to break at that part than any other. He might observe, that the axle-trees of gentlemen's carriages were made parallel; and he had known many of them broken in the centre, as well as at the shoulder.

Mr. Peacock observed, there was no doubt a collar behind the wheel was bad. The question was only, whether the parallel axle or the taper axle was best. He considered that, if Mr. Thorneycroft's experiments had been tried by giving the blow on the wheel instead of the journal, he would have arrived at very different results, and at results also which bore much more upon the practical determination of the question. In the experiment mentioned, where the short end of an axle broke off with seven blows, as contrasted with the other end, which took twenty-four blows to break it, he thought that the fracture was not caused by weight alone, but by vibration; otherwise the short end must have borne a greater weight than the long projection. As the results of the experiments did not coincide with his own experience, he would suggest to Mr. Thorneycroft that he should try other experiments, by applying the blows to the flange of the wheel instead of the journal; and that he should apply this test both to the parallel and taper axles,—dispensing with the collar in both cases.

The Chairman observed that, in order to institute a fair comparison of the relative strength of the taper and the parallel axle, it was necessary to take care that the same weight of iron was employed between the wheels in both cases; if the parallel axle weighed more than the taper axle, it was not a fair comparison of strength. The diagrams exhibited did not shew as much strength of metal in the taper as in the parallel forms.

Mr. G. Thorneycroft replied, that he considered a parallel axle of the same weight with a taper axle would be much the stronger.

Mr. Ramsbottom remarked, that the conclusions, as to the correct form of axles, arrived at by the writer of the paper were entirely different from his own conclusions and experience. He always considered that, whether in the case of axles or machinery of any kind, there must be an error in the proportions, if any one could say beforehand at what point a fracture was likely to occur. There could not be any question that a shoulder behind

the wheel was objectionable; since any sudden variation in the strength must lead to a disturbance of the forces, and eventually to fracture. He could only conceive one instance in railway practice where axles should be parallel, and that was in the case where the forces were applied in a line directly parallel to the axle,—as at *a*, *a*, fig. 3. If a pair of wheels were running, for instance, between rails converging to a point, the axle should be parallel; since the effect of the leverage was the same at all points *b*, *b*, between the wheels. But there was another and more important force, resulting from a lateral blow upon one wheel only, coupled with the load of the vehicle on the axle,—the direction of which would be tolerably well indicated by a line *c*, *d*, fig. 4, drawn from the circumference of the wheel on one side to the centre of the journal on the other side; and if the line *f*, *f*, was drawn perpendicular to this, from the axle close to the wheel, it would represent the greatest effective leverage, tending to break or strain the axle at that point; and the strain upon any other point of the axle might be found by drawing lines *g*, *g*, parallel to this; in fact, the cube roots of these lines would give the diameter of the axle at the points where they fall.

He had remarked that some of the early axles were parallel throughout; but an alteration had been introduced; and they now found the least weight of metal in the centre. Notwithstanding this, he believed the principle was not carried on sufficiently far; since he had never seen a single case of a fracture in the centre of an axle; whilst he had seen a great many broken close to the wheel or near it. This, in his opinion, was sufficient proof that they were not carrying out the principle of taper axles so far as mechanical science and experience suggested.

Mr. T. Thorneycroft suggested, that the further consideration of the question should be adjourned, and offered, before the next meeting, to try further experiments, and lay the results before the members. He would take a long axle, cut it into two parts, each the same weight, and reduce one in the middle, and keep the other parallel all the way along;—taking care that the same weight or metal should exist between the props in each case. He invited members to attend and inspect the experiments whilst they were going forward.

The Chairman observed, that a considerable degree of light had been thrown upon the subject by the discussion. In the conducting of any experiments on axles, it was necessary that they should be subjected to natural blows or forces as similar as possible to those that they are subjected to in practice; because the point which they wanted to ascertain was the positive result in actual working. It had been well observed that the wheel was the anvil or hammer from which the axle received its blow; but, in addition to this, there was a jarring force as well as a bending force, all tending to break it. The experiments that he had previously made had been conducted on that principle, and the

force had been applied to the wheels,—which was requisite in order to obtain true results. As the subject was one of vital importance to railway interests, and materially affected the question of safety in travelling, he thought too much attention could not be bestowed upon it; and the discussion had better be adjourned to a future meeting.

The following paper, by Mr. William Buckle, of Soho, Birmingham, was then read:—

On the Inventions and the Life of William Murdock.

The late William Murdock was born at Bellow Mill, near Old Cumnock, Ayrshire, in 1754, where his father carried on the business of millwright and miller.

So remarkable a man, whose talents and inventions have contributed to the advantage of society, and whose ingenuity was so well known, should not be allowed to go out of the world without some special notice. Little is known of his habits and pursuits prior to his joining the establishment of Messrs. Boulton and Watt, at Soho, in the year 1777, then in its infancy; but he must, before he left his native country, have had celebrity,—as he was employed to build a bridge over the river Nith, in Dumfrieshire: a very handsome structure, which still exists.

His talents were soon justly appreciated at Soho, particularly by the celebrated James Watt, with whom he continued on terms of the warmest friendship to the time of Mr. Watt's death in 1819.

After a short residence of about two years at Soho, Messrs. Boulton and Watt appointed him to superintend the erection and undertake the general charge of their engines in Cornwall, where he erected the first engine with the separate condenser in that district; and he remained there, giving great satisfaction to the mining interest, until the year 1798. As a proof of his usefulness, when the adventurers in the mines heard of his intention to leave Cornwall, and return to Soho, they used all their endeavours to retain his services, and offered him £1000 a year to remain in the county; but his attachment to Soho, and his Soho friends, could not allow him to comply with their urgent request.

In the year 1798 Mr. Murdock returned to take up his permanent residence at Soho Foundry, and superintend the erection of the machinery there, and occasionally the erection of engines at a distance; amongst which may be mentioned the engines of the New River Head, Lambeth, Chelsea, Southwark, East London, West Middlesex, and several other water works. His energies to further the interests and celebrity of the Soho establishment were not used in vain; for they assisted, in no slight degree, in procuring for it a name celebrated throughout the civilized world.—His time there, and for years after, was so completely occupied by his mechanical pursuits, that he had no leisure to devote to any

sort of recreation. The rising sun often found him, after a night passed in incessant labour, still at the anvil or turning-lathe; for with his own hands he would make those articles he would not trust to unskilful ones.

Mr. Watt, in his Notes on Dr. Robinson's Treatise on the Steam-engine, bears testimony to some valuable improvements by Mr. Murdock; and others are recorded in a patent he took out in 1799, which included—

1st.—Boring cylinders by means of an endless screw working into a toothed-wheel, instead of spur-gear, for the purpose of producing a more smooth and steady motion.

2nd.—Steam cases for cylinders cast in one piece, fitted to the cylinder with a conical joint at the top and bottom, instead of being made in separate segments, bolted together with caulked joints, according to the previous practice.

3rd.— The double D-slide valve in place of the four poppet-valves, in Mr. Watt's double-engine, for the purpose of simplifying the construction and working, and saving the loss of steam in the two steam-chests at each stroke; also the cylindrical-valve for the same purpose, with a revolving motion, either continuous, or reciprocating through part of a circle.

4th.—A rotary engine was also included in this patent, which is shewn at fig. 5, Plate XV., consisting of two wheels *a, a*, with teeth *b, b*, working into each other, and fixed in a case *c*, which fits close to the sides of the two wheels and the ends of the teeth,—these parts being made steam-tight by packing *d*. The steam is admitted on the upper side at *e*, and presses on the teeth of the two wheels; driving them round in the direction of the arrows, and passing out to the condenser on the lower side at *f*. Mr. Murdock had one of these engines, of about a half-horse-power, set to work about 1802, at the Soho Foundry, to drive the machines in his private workshop: it continued there for about 30 years, and often in nearly constant work; and it was found to work well. [This engine was exhibited to the meeting.]

Now that locomotive steam-engines have become so extensively used, it is proper to record that the first was made by Mr. Murdock, upon the principle of the non-condensing engine, described in the 4th article of Mr. Watt's specification of 1769 (since adopted in all engines for that purpose); and this engine was seen in 1784, by persons still living, drawing a small model waggon round a room in his house at Redruth, where he then resided.

This original locomotive engine, constructed entirely by his own hands, was frequently exhibited by him to friends, at his house at Handsworth, up to the time of his death, and is still in working order. It is now 66 years old, and was exhibited to the meeting. The boiler is made of copper, with the flue passing obliquely through it, and is heated by a spirit lamp; the cylinder, of $\frac{3}{4}$-inch diameter and 2 inches stroke, is fixed in the top of the boiler; and the piston-rod is connected to the end of the vibrating-beam,

to which is attached the connecting-rod for working the crank of the driving-wheels. There is a double cylindrical slide-valve worked by the vibrating-beam, which strikes the shoulders on the valve-spindle, and the steam is exhausted through the hollow spindle of the valve—passing out near the top. One of the wheels only is fixed upon the crank axle; and a single wheel is placed in front, working in a swivel frame, to allow the engine to run in a small circle.

Mr. Murdock is still better known to the public, and most deservedly so, by his invention of applying the light of gas from coal to economical purposes.

In the year 1792, he employed coal gas for the purpose of lighting his house and offices at Redruth, in Cornwall; and this appears to have been the first idea of applying the light to useful purposes, although the gas had been discovered and obtained both naturally and artificially more than half a century before.

Mr. Murdock, at that time, manufactured the gas in an iron retort, and conveyed it, in pipes, to the different rooms of his house, where it was burned at proper apertures or burners. Portions of the gas were also confined in portable vessels of tinned iron and other materials, from which it was burned when required, forming a moveable gas-light. He had a gas-lantern in regular use, for the purpose of lighting himself home at night across the moors, from the mining engines that he was erecting, to his house at Redruth. This lantern was formed by filling a bladder with gas, and fixing a jet to the mouth-piece of the bladder, which was attached to the bottom of a glass lantern,—the bladder hanging underneath.

After various experiments, by which he proved the economy and convenience of light so obtained, compared with that from oils, or resinous or animal substances, he perfected his apparatus, and made a public exhibition of it, by lighting up the front of Mr. Boulton's manufactory at Soho, on the occasion of the general illumination for the peace of Amiens, in 1802. He subsequently lighted up some cotton mills at Manchester, beginning with that of Messrs. Phillips and Lee; and he published a paper, describing the advantages, in the Philosophical Transactions for 1808, for which the Royal Society presented him with their large Rumford gold medal.

The retort first employed by Mr. Murdock was made of cast-iron, of a cylindrical form, and of small size, placed vertically in a common portable furnace. The inconvenience of removing the coke from this vertical retort led to the adoption of the horizontal cylindrical retorts, which were used by Mr. Murdock in 1802: these retorts were of cast-iron, from 12 to 20 inches diameter, and from 3 to 7 feet in length. The kind of retort he first used at Messrs. Phillips and Lee's mills is somewhat similar to his earliest form, but it was larger in size (holding 15 cwt. of coal), and was provided with an iron cage, to facilitate the dis-

charge of the coke. This cage was let down into the retort previously to charging it with coal, and was afterwards lifted out by means of a small crane, when the process of distillation was completed, bringing with it the whole of the coke.

Mr. Murdock also tried other forms of retorts, having two openings in them, one at top for charging it with coal, and another at the bottom for withdrawing the coke; but these were found to be more costly in manufacture and working, and he adhered ultimately to the simple horizontal retort, which came into general use, and continued so, with little alteration in principle, up to the present time.

His experiments also led him to increase the intensity of the heat employed, and the rapidity of the process of distilling the gas; as he found, from his long continued experiments, that he obtained a greater quantity of gas from the same quantity of coal, with less liquid product and coke, and a greater illuminating power of the gas, when the retorts were heated to a bright red heat, than at any lower or higher temperature.

Mr. Murdock took out a patent in 1810 for boring stone pipes for water, and cutting columns out of solid blocks of stone. Instead of boring out the whole inside contents of the pipe, a solid cylindrical core, of $\frac{1}{2}$ inch less diameter than the inside of the intended pipe, is cut out of the centre of the block of stone by a cylindrical crown saw; or a column is formed by a similar process of cutting it out, in its finished form, from the centre of the block, leaving the rest of the stone in the form of a pipe;—the cores of the larger pipes being available for columns: thus effecting a saving of labour and material.

The apparatus consists of a thin iron cylinder, of the size required, having an iron or copper ring, forming the circular saw, fixed at the bottom, either smooth or with saw-teeth; and the head of the cylinder slides down a vertical spindle, with a feather fitting a groove in the spindle to prevent it turning round. The cylinder is supported by a cord or chain, attached to the head, and passing up through a hole along the centre of the spindle, which is hollow at the upper part. This cord is carried over a pulley; and by this means the cylinder is lowered as the saw advances; and the saw is pressed down by weights, placed on the head. The cylinder is driven round with a reciprocating rotative motion, by a rope passing round a pulley fixed on the top of the spindle, and pulled alternately by a man at each end, or by other power.

A stream of water and sand is poured regularly into the top of the cylinder, from a trough, to supply the saw; and the water, rising to a head in the interior of the cylinder, forces its way under the bottom of the saw, and rises up outside the cylinder, overflowing at the top, and thus continually clears the saw by washing away the sand and grit, and carrying it up the groove cut in the stone. When the depth of the bore exceeded 6 or 7

feet, a readier outlet for the water and the sand was made by boring a small hole in the side of the pipe, which was afterwards plugged up.

A machine was constructed at Soho Foundry on this plan, where it was set to work; and also at Mr. Rennie's works in London. The first pipe bored was of marble, and proved quite successful. The patent was subsequently sold to a company in London, with the object of supplying water of greater purity, by conducting it through stone instead of iron pipes,—which scheme was ultimately abandoned.

Mr. Murdock, in 1802, applied the compressed air of the blast engine employed to blow the cupolas at the Soho Foundry, for the purpose of driving the lathe in the pattern shop, by using it to work a small engine, with a 12-inch cylinder and 18-inch stroke, which was connected to the lathe,—the speed being regulated, as required, by varying the admission of the blast. This engine continued in effective use for about 35 years, and was only discontinued on the occasion of an alteration of the shop.

He also constructed a lift, worked by compressed air, for the purpose of raising and lowering the castings from the boring-mill to the level of the foundry and canal bank, which continued in constant use for about 30 years: it consisted of a piston, working in a cylinder, 10 feet diameter, in water, with a lift of 12 feet; and raised by forcing in air from a small blowing cylinder, 12 inches in diameter, 18 inches stroke, which was worked by the gearing in the boring-mill.

Mr. Murdock also applied compressed air to ring the bells in his house. A small brass cylinder, 1-inch diameter, was fixed against the wall of his rooms, having a piston in it with an iron knob at the top; and a ⅜-inch tube was carried from the bottom of the cylinder to the bell, terminating in a similar cylinder and piston, with a clapper, projecting from it, which struck the bell when the piston was driven outwards by the first piston being pushed down. He had a range of them communicating with the rooms in his house; and these are still in existence, after having worked satisfactorily for 35 years. Sir Walter Scott having once heard a description of them, was so much pleased with the plan, that he had his own house at Abbotsford fitted up in a similar manner.

An accidental circumstance that Mr. Murdock observed, of some iron borings and sal-ammoniac getting mixed together in his tool-chest, and rusting his saw-blade nearly through, led to the invention of the cast-iron cement, that has since become so universal and important an assistance in the construction of engines and machinery, and became a very extensive manufacture at the Soho Works.

He made several experiments on the projectile power of high-pressure steam; and a specimen has been preserved of a lead ball that he fired from a steam-gun against the wall of the Soho Foun-

dry. [This ball was laid before the meeting: it is $1\frac{1}{4}$-inch diameter; and it bears the date of the experiment, 1803, engraved upon it.]

In the year 1815, Mr. Murdock erected an apparatus, of his own invention, for heating the water for the baths at Leamington, by a circulation of water through pipes from a boiler: a process since adopted extensively for heating buildings. The first building heated in this way was the conservatory of his son, at Handsworth; the apparatus of which he erected about the same time; and it remains in use to the present day. The heated water is conducted around the conservatory by a pipe, leading from the top of the boiler, which returns to the boiler, and delivers the cold water in at the bottom; the hot water, by its diminished specific gravity, rises to the top, and its place is occupied by the cold water rushing in at the bottom; and the current is increased as more heat is applied to the boiler: acting on this principle, a rapid current is soon obtained through the pipes.

In his latter years Mr. Murdock's faculties, both corporeal and mental, experienced a gradual decay, and he lived in absolute retirement. He died on the 15th November, 1839, aged 85 years; and his remains were accompanied by several old and attached friends, and the Soho workmen, to their last abode in Handsworth church, and are there deposited near those of Mr. Boulton and Mr. Watt. A bust by Chantrey serves to perpetrate the remembrance of his manly and intelligent features.

The original locomotive, which had been lent for the purpose by Mr. John Murdock, of Handsworth, near Birmingham, was set to work before the meeting.

Mr. Middleton, who, in his youth, had been for many years at the Soho foundry, at the same time with Mr. Murdock, bore testimony to the correctness of many parts of the paper; and remarked, that he had himself frequently worked the rotary-engine up to the year 1814, when he left the establishment. He observed, that Mr. Murdock was entitled to the credit of inventing the pneumatic lift; and he thought the one which had been recently brought before the Institution by Mr. Gibbons was due to Mr. Murdock, who had supplied the particulars of his lift at Soho foundry, and the designs for another construction of lift working with a revolving drum.

Mr. Slate, in the absence of Mr. Gibbons, observed, that he thought there was an essential difference between the lift which had been previously described by him and that originally invented by Mr. Murdock.

The Chairman remarked, it was gratifying to observe the feeling of attachment which was so strong in the minds of all who had been connected with those who might be termed the patriarchs of mechanical engineering in this country. He might mention that it had been remarked to him, as a striking instance of the value of institutions like the present, that at the close of the last

century, Watt, Boulton, Wedgwood, Murdock, Keir, Darwin, and Priestly, all eminent in some department of science, art, or enterprise, were connected with the Lunar Society, held regularly for several years in Birmingham; the name of which was derived from the fact of their meetings taking place at the occurrence of the full moon, as being the most convenient time for their returning home. When they bore in mind the eminence which these men individually attained, they could not fail to be struck with the advantages resulting from the interchange of mind with mind.

Society of Arts.

FIRST ORDINARY MEETING.

Nov. 13th, 1850.

LORD OVERSTONE IN THE CHAIR.

Mr. Paxton read a paper descriptive of his design for the building for the Exhibition of all Nations, and of the gradual development of the method of construction employed.

The author began by stating, that the Great Exhibition Building was the development and result of a very long series of experiments, made by him at Chatsworth, in the erection of the different horticultural buildings there, on which he had been engaged since the year 1828. The pine-house, built in 1833, was the first in which the ridge-and-furrow roof—an essential feature in the great building—was employed. This roof was contrived by the author, so that the glass in it might be more nearly at right angles to the slanting and weak, though valuable, rays of the morning and evening sun, than the glass used in straight roofs. So well was it found to answer, that in 1834 he built a green-house, 97 feet 6 inches by 26 feet, with a mean height of 14 feet 6 inches. This building, even under the old glass tax, cost only 2*d*. per cubit foot. It was followed, in 1836, by a "curvilinear" hot-house, 60 feet by 26 feet, so called from the roof being a quarter circle: here the Victoria Regia first flowered in 1849. In the following year the great conservatory was commenced; and, in order to economise labour in its construction, the author invented a machine for forming the sash-bars, by which he effected a saving of £1400; and for which the Society of Arts, in 1841, gave him the silver medal. This has been the type of all the machines for wooden sash-bars since used. For this building sheet-glass was first made, by the Messrs. Chance and Co., of the length of 4 feet,—nothing beyond 3 feet having ever before been made. The great conservatory is 277 feet long, 123 feet wide, and 67 feet to the crown of its domed roof.

In a conservatory at Darley Dale, in 1840, the author first em-

ployed the ridge-and-furrow roof on a level,—that is, neither curvilinear nor inclined, as in the former cases. The breadth of this building is 17 feet; and so successful was it, that, in a letter from the proprietor, it was said to be constantly used as a sitting-room by his family. This was more extensively carried out in the new Victoria Regia house, 60 feet 6 inches in length and 46 feet 9 inches in breadth, with a clear span for the roof of 33 feet 6 inches; and which, on its small scale, is a perfect type of the great building.

THE INDUSTRIAL BUILDING.

The inducement for offering a design for this building was the following:—When plans for the structure were sent in by various parties to the Royal Commissioners, many forcible reasons were urged, in the daily papers, against the propriety of erecting a large building of bricks and mortar in Hyde Park. It was then that the author turned his attention to the matter; and he became at once convinced, that the least objectionable structure, to occupy a public park, would be an erection of cast-iron and glass; whilst, at the same time, a building of this description would be the very best adapted for the purposes of the exhibition. The time for receiving the designs had expired; but, from having the whole matter already digested, and the system of ridge-and-furrow *flat* roofs so fully in his mind, it only required the adaptation of the principle, on a large scale, to suit the vast building for the exhibition. His plans were got up in about ten days, and ultimately received the approval of the Commissioners. The design for the building was planned—first, with particular consideration as to its fitness for the object in view, namely, the Exhibition of 1851; secondly, its suitableness for the site proposed; and, lastly, with a view to its permanence as a winter garden, or vast horticultural structure, or a building which might, if required, be again used at any future period for a similar exhibition to that of 1851.

One great feature in the present building is, that no stone, brick, or mortar, need be used; but the whole is composed of dry material, ready at once for the articles to be exhibited By combination of no other materials but iron, wood, and glass, could this important point be effected; which, when we consider the limited period allowed for the erection of so stupendous a structure, may almost be deemed the most important object. The absence of any moist material in the construction, together with the provision made for the vapours which must arise and be condensed against the glass, enables the exhibitor at once to place his manufactures in their respective situations, without the probability of articles, even of polished ware, being tarnished by their exposure.

It may be important here to state that, it is unnecessary to cut down any of the large timber trees, provision being made, by

means of a curvilinear roof over the transept of the building, for them to stand beneath the glass, and by a proper diffusion of air they will not suffer by the enclosure. (Mr. Paxton here proceeds to describe the drawings of the plans of the building, as exhibited upon the walls of the room, shewing the original idea of the building and the improved design as it now stands.) The height of the centre aisle is 64 feet, the side aisles 44 feet, and the outside aisles or first-story 24 feet. The transept is 108 feet in height, and is covered with a semicircular roof, like that of the great conservatory at Chatsworth, in order to preserve the large elm trees opposite to Prince's-gate. The whole number of cast-iron columns is 3,300, varying from 14 feet 6 inches to 20 feet in length. There are 2,224 cast and wrought-iron girders, with 1,128 intermediate bearers, for supporting the floors of the galleries over the large openings of the aisles. The girders are of wrought-iron, and those for the galleries are of cast-iron. The fronts of the galleries are also supported by cast-iron girders. The dimensions of the building are 1,851 feet in length, and 456 feet in breadth in the widest part. It covers, altogether, more than 18 acres, and the whole is supported on cast-iron pillars, united by bolts and nuts fixed to flanges turned perfectly true, and resting on concrete foundations. The total cubic contents of the building are 33,000,000 feet. The six longitudinal galleries, 24 feet in width, running the whole length of the building, and the four transverse ones, of the same dimensions, afford 25 per cent. additional exhibiting surface to that provided on the ground-floor. This extra space is suited for the display of light manufactured goods, and will also give a complete view of the whole of the articles exhibited, together with an extensive view of the interior of the building. In order to give the roof a light and graceful appearance, it is built on the ridge-and-furrow principle, and glazed with British sheet glass, as previously described. The rafters are continued in uninterrupted lines the whole length of the building. The transept portion, although covered by a semicircular roof, is also on the angular principle. All the roof and upright sashes being made by machinery, are put together and glazed with great rapidity,—for, being fitted and finished before they are brought to the place, little more is required on the spot than to place the finished materials in the positions intended for them. The length of sash-bar requisite is 205 miles. The quantity of glass required is about 900,000 feet, weighing upwards of 400 tons. All round the lower tier of the building, however, will be boarded with fillets planted on in a perpendicular line with the sash-bars above.

The gutters are arranged longitudinally and transversely: the rain-water passes from the longitudinal gutter into a transverse gutter over the girders, and is thus conveyed to the hollow columns, and thence to the drains below. As these transverse gutters are placed at every 24 feet apart, and as there is a fall in the

longitudinal gutters both ways, the water has only to run a distance of 12 feet before it descends into the transverse gutters, which carry it off to the hollow columns or down-pipes. The grooves for carrying off the moisture which condenses on the inside of the glass are cut out of the solid; in fact, the whole gutter is formed by machinery at one cut. The gutter is cambered up by tension-rods, having screws fixed at the ends, so as to adjust to the greatest nicety, as is the case with the wrought-iron girders which span the Victoria Lily House.

Many experiments were tried in order to find out the most suitable floors for the pathways of horticultural structures. Stone was objectionable, chiefly on account of the moisture and damp which is retained. The difficulty of getting rid of the waste from the watering of plants was also an objection; but perhaps the greatest was the amount of dust from sweeping. It likewise appeared that close boarding for pathways was open to many of the same objections as stone; for although damp and moisture was in part got rid of, yet still there were no means of immediately getting rid of dust. These various objections led the author to the adoption of trellised wooden pathways, with spaces between each board, through which, on sweeping, the dust at once disappears, and falls into the vacuity below. Whilst the accomplishment of this point is most important in plant-houses, it is doubly so with the industrial building, where there will be such an accumulation of various articles of delicate texture and workmanship. Before sweeping the floors, the whole will be sprinkled with water from a moveable hand-engine, which will be immediately followed by a sweeping machine, consisting of many brooms fixed to an apparatus on light wheels, and drawn by a shaft. Thus a large portion of ground will be passed over very quickly. The boards for the floor will be 9 inches broad and 1½-inches thick, laid half an inch apart, on sleeper joists 9 inches deep and 3 inches thick, placed 4 feet apart. This method of flooring, then, possesses the following advantages:—It is very economical; dry, clean, pleasant to walk upon; admits of the dust falling through the spaces; and even when it requires to be thoroughly washed, the water at once disappears betwixt the openings, and the boards become almost immediately fit for visitors. The galleries will be laid with close boarding.

The *ventilation of the building* has been most carefully considered, and a most copious supply of pure air is provided. Four feet round the whole of the basement part of the building is made of *louvre-boarding;* and at the top of each tier a similar provision of 3 feet is made, with power to add an additional quantity if required. In the centre aisle, also, the air will be plentifully admitted.

By simple machinery the whole of this ventilation can be regulated with the greatest ease. The advantages of this kind of ventilation are several. Louvre boards are very simple in con-

struction; they can be opened and closed instantaneously with the greatest readiness; they nicely distribute the air, and yet admit a large volume of it; and, from the manner in which they are placed over each other, they effectually prevent the entrance of wet in rainy weather.

In order to subdue the intense light, in so large a building covered with glass, all the south side of the upright parts, and the whole of the angled roof, will be covered outside with canvass or calico, so fixed as to allow a current of air to pass between the canvass and the roof. In very hot weather, water may be poured on, which will very much assist in cooling the temperature within. Provision will be made to use the Indian plan of ventilation, if the heat is so intense as to render it desirable to have the temperature cooler than out of doors. A house was fitted up last summer at Chatsworth, as an experimental place to try this mode of ventilating, when it was found to answer the purpose admirably. The temperature was reduced in one hour from 85° to 78°, without any other means being used to increase the draught through the building. This sort of covering offers the following advantages:—the brightness of the light will be tempered and subdued; the glass will be protected from the possibility of injury by hail; the screen being placed on the outside will render the building much cooler than if it were placed inside; and through this provision the ventilation can be regulated at pleasure. From the side galleries, running the whole length of the building, there will be grand views of the goods and visitors below; whilst the transverse galleries in the middle and at the ends will afford ample means for general supervision, and will serve to communicate between the side galleries. Magnifying glasses, working on swivels, placed at short distances, will give additional facility for commanding a more perfect general view of the Exhibition. After the Exhibition is over, the building might be converted into a permanent winter garden, and have carriage drives and equestrian promenades made through it. Pedestrians would have about two miles of galleries, and two miles of walks upon the ground floor, and sufficient room would then be left for plants. The whole intermediate spaces between the walks and drives could be planted with shrubs and climbers from temperate climates. In summer the upright glass might be removed, so as to give the appearance of a continuous park and garden. A structure where the industry of all nations is intended to be exhibited, should, it is presumed, present to parties from all nations a building for the exhibition of their arts and manufactures that, while it affords ample accommodation and convenience for the purposes intended, would, of itself, be the most singular and peculiar feature of the exhibition: how far this has been accomplished, must be left to the community to decide. It will be seen that from the simplicity of the Exhibition building of 1851 in all its parts, together with the simplicity of the detail,

its construction does not offer matter for much detail. The author, in conclusion, remarked, that structures of this kind are susceptible of the highest kind of ornamentation in stained glass and general painting; and that they may well be expected to come into almost universal use. This system of building, he said, is capable of application to manufacturing purposes, as well as general cemeteries; and even market-gardeners might advantageously employ it in the growing of foreign fruit for the London markets. In short, there is no limit to the uses to which it may be applied—no foresight can define the limits where it will end; and we may congratulate ourselves that in the 19th century the progress of science and the spirit of manufacturers have placed at our disposal the application of materials which were unknown to the ancients, and thereby enabled us to erect such structures as would have been deemed impossible even in the early part of the present century.

Several questions were then put to Mr. Paxton with reference to the details of his plan, which he answered apparently to the satisfaction of the meeting.

Nov. 20th.

WILLIAM FOTHERGILL COOKE, Esq. in the Chair.

A paper was read by Mr. Murchison on the origin, progress, and present prospects of the Society of Arts; but the principal feature of interest on this evening was the "Exhibition to Illustrate the State and Progress of Invention during the last Eighteen Months," which was then first thrown open to the public.

Scientific Adjudication.

ROLLS' COURT.—*Monday, November 18th,* 1850.

BAXTER *v.* COMBE.

The following judgment of the Master of the Rolls will be read with interest by all parties engaged in flax dressing, from the complete negative which it puts to what may be truly designated as one of the most glaring assumptions of right that was ever based upon a patent grant:—

A motion has been made in this case, on behalf of the plaintiffs, that the defendants, James Combe and William Dunville, may be restrained by injunction from all further infringement upon the exclusive right of the plaintiffs to the invention in the plaintiffs' bill mentioned, and which was intended to be secured to the plaintiff, Peter Carmichael, for and on behalf and in trust for the

other plaintiffs, by the letters patent in the plaintiffs' bill mentioned, and which bear date the 14th, and were enrolled on the 16th day of May, 1846; and from directly and indirectly making, using, or putting in practice, the said invention, or any part thereof, contrary to the tenor of the said letters patent, or from, in any manner, counterfeiting, imitating, or resembling the said invention, or any part thereof, or making any addition thereto or subtraction therefrom; and that, for that purpose, the said defendant may be especially restrained from making, constructing, or causing to be made or constructed, any machine or piece of mechanism, such as is mentioned or described in the said letters patent, or the description or specification which was filed, pursuant to the said letters patent, by the plaintiff, Peter Carmichael, as having been discovered or invented by him, and as limited by the disclaimer in bill mentioned, or any imitation thereof; or selling, or otherwise disposing of, without the permission of the plaintiffs, any such machinery, or pieces of mechanism, or apparatus, until the hearing of this cause, or further order to the contrary; or, if the Court should not be pleased so to restrain the said defendants until the plaintiffs shall have established at law their right to the exclusive use of the said invention, then that the plaintiffs' bill, in this cause, shall be retained until such time as the Court shall be pleased to direct,—the plaintiffs undertaking to proceed forthwith, by action at law, against the said defendants, in the name of the plaintiff, Peter Carmichael, or otherwise, as they may be advised, for the purpose of establishing such right; and that the defendants shall, in the meantime, keep an account of all such machines and mechanical apparatus as shall be made or constructed by them in imitation of the said invention, or by their order, or for their use, and of the profits of the sales thereof; and that, for the purpose of having the substantial question at issue between the plaintiffs and defendants duly tried, the said defendants shall be restrained from relying upon such trial, upon the articles of agreement in the plaintiffs' bill, mentioned to bear date the 23rd day of April, 1846, as precluding the plaintiff, Peter Carmichael, from maintaining such action at law; and that the said defendant, James Combe, shall bring in and deposit, with one of the Masters of this Honorable Court, or undertake to produce upon the said trial, and for the purposes thereof, the several letters in the plaintiffs' bill, mentioned to have been written by the plaintiff, Marsden, to the defendant, James Combe, and which bear date, respectively, the 2nd January, the 7th April, 14th April, and 25th October, 1847, and which the defendant, James Combe, admits, by his answers, to be in his possession. It appears that, previous to 1846, there was a machine called Robinson's flat machine, used for the purpose of dressing and heckling flax. A patent was obtained for Robinson's machine, which has expired. It appears that a portion of the process of heckling and cleansing the flax in that machine was performed by machinery, and another

portion by manual labour. The part of the process which was carried on by manual labour was turning or reversing the holders, and moving these holders along the table—the object of this being to heckle both sides of the flax. This part of the process was performed by manual labour. The rest of the process was carried out by machinery. It was found, in practice, that the effect of performing this part of the process, by manual labour, was, that, if the manual labour was carelessly performed, the process was not effectual. It therefore became a great object to discover a mode by which the whole process should be carried out by machinery. One of the plaintiffs, Peter Carmichael, invented, or supposed that he had invented, a mode by which the whole process of heckling and dressing could be carried on by machinery; and having thus, as he considered, invented this new process, he entered into an agreement with the other plaintiffs, in April, 1846. The object of that agreement was, that they should become partners in that invention, Shortly afterwards, in May, 1846, Peter Carmichael, one of the plaintiffs, took out a patent. I pass by, for the present, the correspondence between one of the plaintiffs and the defendant, in the interval; but it appears that the defendant, James Combe, also invented, as he alleges, a machine calculated to carry out the same process—that is, to supply the defect in Robinson's machine, and to have that done by machinery which was previously performed by manual labour. The present bill has been filed, alleging that the defendant has infringed on the plaintiffs' patent. I think it quite plain on the authorities—indeed, the plaintiffs' counsel have not disputed it—that it is impossible legally to patent a *principle*, and therefore it would be impossible—merely because a certain portion of the process carried out by Robinson's flat machine was done by manual labour—for any person, who has invented a mode by which that which was previously done by manual labour may be done by machinery, to prevent any other person from having recourse to machinery for the same purpose, provided his machine was not a copy, or a colorable copy, of the invention of the other parties. You cannot prevent another from saying, "I also will dispense with manual labour, but I will do it by a process which is much better than yours." It is quite plain that the plaintiff was not at liberty to patent a principle. But this suit has been instituted on the allegation, on the plaintiffs' part, that the defendants' machine is a colorable imitation of the plaintiffs' invention. I have read the specifications on both sides. Both refer to drawings; and I find it impossible, and therefore useless, to attempt to come to a conclusion as to whether one is a colorable imitation of the other. But it is plain to me, unless some difficulty arises from the correspondence in this case, that this case falls within that class of cases in which the Court will not interfere by injunction in the first instance, but will direct an action to be brought. There is no doubt that, where there has been a long

and uninterrupted possession of a patent, this Court has, in some instances, interfered summarily.· The latest case in which that was done is Stephens *v.* Keatinge, 2 Phillips, 333, in which case an injunction was granted, although there had been no trial at law. But the patent in that case was comparatively of an old date. It was granted in 1835, and the application for the injunction was in 1847. Lord Cottenham points out in that case the exception to the general rule which exists in cases of patents. He says, "In patent cases, however, a rule steps in, which is quite consistent with the general rule to which I have just referred, and, indeed, is only an instance of the exception which a correct statement of that rule must always include, viz.,—that long and uninterrupted possession shall be considered such *prima facie* evidence of title as to justify the Court in protecting the patent right by an injunction, until its invalidity, if it be invalid, shall have been established by an action at law." It is clear that, in this case, there is not that long and uninterrupted possession of the patent which brings the case within the exception to the general rule. The dates in this case, and the plaintiffs' delay, justify the Court in requiring that an action should be brought. The plaintiffs' patent was inrolled in November, 1846. No doubt the correspondence to which I shall advert just now, took place in the interval between the plaintiff, Marsden, and the defendant, Combe,—but the parties were at arms' length so long ago as November, 1847. The plaintiff's solicitor wrote a threatening letter in June, 1848, threatening proceedings at law. In the same month there was an answer by the defendant, referring to a solicitor, who said he was ready to enter an appearance, and the bill was not filed until the month of November, 1849. If there has been an infringement of his patent, the plaintiff might have brought his case before the Court two years ago. I think it clear, therefore, unless there is something in the correspondence between the plaintiff, Marsden, and the defendant, Combe, which imposes a duty on me to grant the injunction, that this is not a case of long and uninterrupted possession within the exception to the general rule. The plaintiff, however, has strongly contended that the correspondence between Marsden and Combe ought to influence the Court either in granting an injunction or putting defendant under terms. It is not necessary to go through that correspondence. I may state, generally, that what was mainly relied on in it is, that, in the interval between November, 1846, when the patent was inrolled, and November, 1847, the defendant had agreed with Marsden to purchase the right to use the plaintiff's patent, and, accordingly, did use it. But there are two defences set up by the answer—first, that the plaintiff's patent was invalid. There are three different grounds on which it is alleged to be invalid:—First, that it is not an original invention; secondly, that the specification was imperfect; and, thirdly, that it is an attempt to patent a principle. It was

contended, on the part of the plantiff, that the defendant having agreed with the plaintiff to purchase the right to use the patent which the plaintiff had enrolled in November, 1846, a sort of estoppel arose, which precluded him from raising the point of the invalidity of the patent; and it is said that he cannot dispute the validity of the patent of which he has become the equitable assignee. But the invalidity of the patent is not the only defence set up by the answer. It also states, that the defendant never infringed the patent; he says, that the mode by which the end was obtained by his machine is totally different from that by which it was obtained by the plaintiff's machine, and that it is impossible to patent a principle. There are many patents which I could refer to which shew that a *principle* cannot be patented. For example, there are no less than three modes of preserving timber from dry rot, and three patents seeking the same object. As to the objection of estoppel, it only applies to one portion of the defence,—viz., the invalidity of the patent. It is no answer to the defence, that the defendant never infringed the patent. There is, therefore, no foundation for the argument, that I ought to grant an injunction on that ground. But, though the defendant were to be considered as assignee of the patent, I am not prepared to admit, that the effect of a license to use the patent would, in equity, create an estoppel. That point arose in the case of Pidding *v.* Franks, 1 M'Naghten and Gordon, 56. In that case the plaintiff had obtained a patent for his invention for hermetically-sealed self-clarifying coffee, and he assigned to the defendant, Swinburne, the sole and exclusive license for the manufacture and sale of the patent. Swinburne made an equitable assignment of all his interest under the deed to the other defendants. The bill, after stating that these defendants had adulterated the coffee and sold it in the plaintiff's packages, prayed an injunction. The answers disputed the validity, and disclaimed the use of the patent. Counsel submitted that, as licensees of the patent, the defendants were estopped from denying its validity, and cited several cases at law to that effect; but Lord Cottenham thought the case so plain, that he did not call on the defendants' counsel. He said—"Are the defendants not to be at liberty to say, we have bought the patent and paid for it, but we do not intend to use it: they are mere equitable assignees, and why should they be deprived of this right, which every stranger has, of disputing the validity of the patent? It is no ground for interposition by injunction, that at one time they thought of availing themselves of the patent and have now chosen to abandon it. A party cannot be called upon to admit that which is the very point he disputes. Before the Court exacts any such admission as the plaintiff here seeks, it ought to be clearly satisfied that the case he sets up is made out." I do not see any distinction in principle between that and the present case. I offer no opinion as to how far the cases at law may be brought to bear. All I say

is, that, according to the view taken by Lord Cottenham and Vice-Chancellor Knight Bruce, the circumstance of having used the patent does not prevent the party from saying that it is invalid. I see no ground for putting the party under terms. I have, accordingly, drawn up the order exactly in conformity with the order of the Vice-Chancellor in that case, as affirmed by Lord Cottenham. It is, that the motion for the injunction shall stand over, without prejudice to any question in the cause, with liberty to the plaintiffs, or the plaintiff, P. Carmichael, to bring such action at law as he or they may be advised, against the defendants or either of them, with liberty to the parties to apply, as they may be advised; and the defendant, Combe, is to produce the letters subject to exception. I should be justified in making an order for the production of documents, and having them locked up in the Master's office; but it has been found inconvenient to order documents to be lodged in the Master's office; therefore, I have merely ordered the defendant to produce them at the trial. At the same time, I have guarded the order, so as to offer no opinion as to whether they will be admissible in evidence.

Solicitor for the plaintiffs—Mr. Michael Maley, Dublin.

Solicitors for the defendants—Messrs. H. J. & T. Garrett, Belfast.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th October to the 17th November, 1850, inclusive.

To Maxwell Miller, of Glasgow, in the county of Lanark, coppersmith, for certain improvements in distilling and rectifying.—Sealed 30th October.

Charles Bury, of Salford, in the county of Lancaster, manager, for certain improvements in machinery or apparatus for cleaning, spinning, doubling, and throwing raw silk.—Sealed 4th November.

Robert Lucas, of Furnival's-inn, in the city of London, mechanical draughtsman, for improvements in telegraphic and printing apparatus,—being a communication.—Sealed 11th November.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture of candles and wicks.—Sealed 11th November.

Antoine Pauwells, of Paris, France, merchant, and Vincent Dubochet, also of Paris, France, merchant, for certain improvements in the production of coke and of gas for illumination, and also in regulating the circulation of such gas.—Sealed 11th November.

Etienne Joseph Hanon Valcke, of the Kingdom of Belgium, miller, for improvements in grinding.—Sealed 13th November.

List of Patents

Granted for SCOTLAND, subsequent to October 22nd, 1850.

To Etienne Masson, of Place St. Michel, at Paris, gardener, for improvements in the preparation of certain vegetable alimentary substances, for the provisioning of ships and armies, and other purposes where the said substances are required to be preserved. —Sealed 25th October.

Zachariah Morley, of Regent's-park, London, for certain improvements in the means or methods of, or apparatus or machinery for, decomposing water, and applying the products to useful purposes,—being a communication.—Sealed 28th October.

Robert Lucas, of 3, Furnival's-inn, London, mechanical draughtsman, for improvements in telegraphic and printing apparatus,—being a communication.—Sealed 31st October.

George Michiels, of London, for improvements in treating coal, and in the manufacture of gas, and also in apparatus for burning gas,—being a communication.—Sealed 5th November.

William Henry Ritchie, of Kennington, London, for improvements in stoves,—being a communication.—Sealed 6th November.

Peter Spence, of Pendleton, Manchester, manufacturing chemist, for improvements in the manufacture of alum and certain alkaline salts, and in the manufacture of cement; part of which improvements are applicable in obtaining volatile liquids.—Sealed 7th November.

Alfred George Anderson, of Great Suffolk-street, London, soap manufacturer, for improvements in the treatment of a substance produced in soap-making, and its application to useful purposes. —Sealed 7th November.

John Mc'Nicoll, of Liverpool, engineer, for improvements in machinery for raising and conveying weights.—Sealed 7th November.

John Lienau, jun., of Wharf-road, City-road, London, merchant, for improvements in purifying or filtering oils and other liquids. —Sealed 7th November.

John Tatham and David Cheetham, of Rochdale, machine-makers, for certain improvements in the manufacture of cotton and other fibrous materials, and fabrics composed of such materials. —Sealed 7th November.

Hugh Mair, of Ingram-street, Glasgow, manufacturer, for improvements in certain classes of figured muslins, and in the machinery or apparatus employed in the manufacture or production thereof; which improvements, or parts thereof, are applicable to harness-weaving generally.—Sealed 11th November.

George Hurwood, of Ipswich, engineer, for improvements in grinding corn and other substances.—Sealed 11th November.

Evan Protheroe, of Austin-friars, London, merchant, for improvements in the manufacture of oxide of zinc, and in making paints from oxide of zinc,—being a communication.—Sealed 11th November.

Rodolphe Helbronner, of Regent-street, London, for improvements in preventing the external air and dust and noise from entering apartments,—being a communication.—Sealed 11th November.

James Samuel, of Willoughby House, London, civil engineer, for certain improvements in the construction of railways and steam-engines, and in steam-engine machinery.—Sealed 12th November.

Theodore Cartali, of Manchester, merchant, for certain improvements in the treatment or preparation of yarns or threads for weaving, and in the manufacture of certain woven fabrics,—being a communication.—Sealed 13th November.

John Clare, jun., of Exchange-buildings, Liverpool, for improvements in the manufacture of metallic casks.—Sealed 13th November.

Charles Bury, of Salford, manager, for certain improvements in machinery or apparatus for preparing and spinning, doubling or twisting silk-waste, cotton, wool, flax, or other fibrous substances,—Sealed 13th November.

Richard Clyburn, engineer to the firm of D. Maclean & Son, of St. George-street East, London, for improvements in wheel carriages,—being partly a communication.—Sealed 14th November.

John Tucker, of the Royal Dockyard, Woolwich, Kent, shipwright, for improvements in steam-boilers, and in gearing, cleansing, and propelling vessels,—being a communication.—Sealed 15th November.

John Robert Johnson, of Crawford-street, London, chemist, for improvements in fixing colors on fabrics made of cotton or other fibre.—Sealed 15th November.

Clement Augustus Kurtz, of Manchester, practical chemist, for improvements in dyeing,—being a communication.—Sealed 15th November.

Antoine Pauwells, of Paris, merchant, and Vincent Dubochet, also of Paris, merchant, for certain improvements in the production of coke and of gas for illumination; and also in regulating the circulation of such gas.—Sealed 18th November.

Robert Cotgreave, of Eccleston, county of Chester, farmer, for certain improvements in machinery or apparatus for draining and cultivating land.—Sealed 19th November.

John Hamilton, of Princes-square, Glasgow, and John Weems, of Johnstone, Renfrewshire, for improvements in warming and ventilating buildings and structures.—Sealed 20th November.

John Turner, of Birmingham, engineer, and Joseph Hardwick, of Birmingham. builder, for a certain improvement or certain im-

provements in the construction and setting of steam-boilers.—Sealed 20th November.

Alexander Mein, of Glasgow, accountant, trustee on the sequestrated estate of the late James Smith, of Deanston, for certain improvements in treating the fleeces of sheep when on the animals; same being the invention of the said deceased J. Smith, who obtained a Scotch patent for the same on 20th December last; but in consequence of his death, the specification has not been inrolled.—Sealed 20th November.

Colin Mather, of Salford, engineer, and Ferdinand Kaselowsky, of Berlin, engineer, for improvements in machinery for washing, steaming, drying, and finishing cotton, linen, and woollen fabrics.—Sealed 21st November.

John Matthews, of Kidderminster, foreman, for improvements in sizing paper,—Sealed 22nd November.

William Radley, chemical engineer, and Frederick Meyer, oil-merchant, both of Lambeth, for improvements in treating fatty, oleaginous, resinous, bituminous, and cerous bodies; in the manufacture and application of them and of their compounds and subsidiary products, together with the apparatus to be employed therein to new and other purposes.—Sealed 22nd November.

Edwin Pettitt, of Birmingham, civil engineer, for improvements in the manufacture of glass; in the method of forming or shaping and ornamenting vessels and articles of glass; and in the construction of furnaces and annealing kilns.—Sealed 22nd November.

New Patents
SEALED IN ENGLAND.
1850.

To Matthew Hodgkinson, of Red-street, near Newcastle-under-Lyne, in the county of Stafford, mine agent, for improvements in furnaces or apparatus for smelting ores and minerals; and for the making of pig-iron. Sealed 2nd November—6 months for inrolment.

Victor Emile Warmont, of Neuilly Seine, in the Republic of France, for improvements in dyeing wool and other fibrous materials and fabrics. Sealed 2nd November—6 months for inrolment.

Joseph Christian Davidson, of Yalding, in the county of Kent, brickmaker, for improvements in lime and other kilns and furnaces. Sealed 2nd November—6 months for inrolment.

John Matthews, of Kidderminster, foreman, for improvements in sizing paper. Sealed 2nd November—6 months for inrolment.

Jonas Bateman, of Upper-street, Islington, cooper, for improve-

ments in life boats. Sealed 2nd November—6 months for inrolment.

Archibald Slate, of Woodside Iron Works, Dudley, for improvements in canal navigation. Sealed 2nd November—6 months for inrolment.

Pierre Antoine Auguste Delabarre de Nanteuil, of Leicester-street, in the county of Middlesex, for improvements in propelling carriages,—being a communication. Sealed 2nd November—6 months for inrolment.

William and Colin Mather, of Salford, engineers, and Ferdinand Kaselowsky, of Berlin, in the Kingdom of Prussia, engineer, for improvements in machinery for washing, steaming, drying, and finishing cotton, linen, and woollen fabrics. Sealed 2nd November—6 months for inrolment.

John Borland, of Norfolk-street, Strand, engineer, for certain improvements in weaving machinery. Sealed 2nd November—6 months for inrolment.

John Slate, of Wandsworth, in the county of Surrey, accountant, for improvements in stoves and furnaces; and in chimney pots and regulators. Sealed 2nd November—6 months for inrolment.

John Tatham and David Cheetham, of Rochdale, in the county of Lancaster, machine makers, for certain improvements in the manufacture of cotton and other fibrous materials, and fabrics composed of such materials. Sealed 2nd November—6 months for inrolment.

Richard Clyburn, engineer to the firm of D. Maclean & Son, of St. George-street East, in the county of Middlesex, for improvements in wheel carriages,—being partly a communication. Sealed 2nd November—6 months for inrolment.

James Black, of Edinburgh, machine maker, for a machine for folding,—being partly a communication. Sealed 7th November—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson & Co., of Fleet-street, patent agents, for improvements in railways,—being a communication. Sealed 7th November—6 months for inrolment.

William Fairbairn, of Manchester, in the county of Lancaster, civil engineer, for improvements in cranes and other lifting or hoisting machines. Sealed 7th November—6 months for inrolment.

William Crane Wilkins, of Long Acre, in the county of Middlesex, engineer, for an invention for lighting; and in apparatus for lighthouses, signal, floating, and harbour lights. Sealed 7th November—6 months for inrolment.

Samuel Edwards, James Ansell, and Patrick Heyns, of Shadwell, in the county of Middlesex, engineers, for certain improvements in obtaining and applying motive power; and in pumps. Sealed 7th November—6 months for inrolment.

George Frederick Morrell, of Fleet-street, in the City of London, Gent., for improvements in obtaining and applying motive power; and also in pumps. Sealed 7th November—6 months for inrolment.

John Alexander Lerow, of Boston, in the United States of America, Gent., for certain improvements in sewing machines. Sealed 7th November—6 months for inrolment.

Benjamin Guy Babington, of George-street, Hanover-square, in the county of Middlesex, Doctor of Medicine, for improvements in preventing incrustation of steam and other boilers. Sealed 7th November—6 months for inrolment.

John Clare, jun., of Exchange-buildings, Liverpool, Gent., for improvements in the manufacture of metallic casks. Sealed 7th November—6 months for inrolment.

John Robinson, of Stepney, in the county of Middlesex, engineer, for improvements in lifting and moving fluid and other bodies; and in apparatus for steering ships and other vessels. Sealed 7th November—6 months for inrolment.

David Christie, of St. John's-place, Broughton, in the borough of Salford and county of Lancaster, merchant, for improvements in machinery or apparatus for preparing, carding, spinning, doubling, twisting, weaving, and knitting cotton, wool, and other fibrous substances; also for sewing and packing,—being a communication. Sealed 7th November—6 months for inrolment.

Robert Lucas, of Furnival's Inn, in the City of London, mechanical draughtsman, for improvements in telegraphic and printing apparatus,—being a communication. Sealed 7th November—6 months for inrolment.

Thomas Main, of the Strand, printer, for improvements in printing machinery. Sealed 8th November—6 months for inrolment.

James Rock, jun., of Hastings, in the county of Sussex, coachbuilder, for certain improvements in carriages; which are also applicable, in whole or in part, to other machines. Sealed 9th November—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture of candles and night-lights. Sealed 9th November—6 months for inrolment.

James Scott, of Falkirk, N. B., shipwright, for certain improvements in docks, slips, and apparatus connected therewith. Sealed 9th November—6 months for inrolment.

Sir Francis Charles Knowles, of Lovell, in the county of Bucks, Bart., for improvements in the manufacture of charcoal. Sealed 9th November—6 months for inrolment.

Lucien Vidie, of 14, Rue du Grand Chantier, Paris, in the Republic of France, French advocate, for improvements in measuring the pressure of air, steam, gas, and liquids. Sealed 9th November—6 months for inrolment.

Joseph Nye, of Mill Pond Wharf, Old Kent-road, engineer, for improvements in hydraulic machinery; parts of which improvements are applicable to steam-engines and machinery for driving piles. Sealed 12th November—6 months for inrolment.

George Robins Booth, of London, engineer, for improvements in the manufacture of gas. Sealed 12th November—6 months for inrolment.

Peter Spence, of Pendleton, Manchester, manufacturing chemist, for improvements in the manufacture of alum and certain alkaline salts, and in the manufacture of cement; part of which improvements are applicable in obtaining volatile liquids. Sealed 12th November—6 months for inrolment.

Edwin Clark, of Palace New-road, in the county of Middlesex, civil engineer, and Henry Mapple, of Child's Hill, Hampstead, electric engineer, for improvements in electric telegraphs, and in apparatus connected therewith. Sealed 12th November—6 months for inrolment.

Henry Medhurst, engineer, in the employ of Messrs. Shears and Sons, of Bankside, Southwark, for improvements in gas-meters. Sealed 12th November—6 months for inrolment.

Etienne Masson, of Place St. Michel, at Paris, gardener, for improvements in the preparation of certain vegetable alimentary substances for the provisioning of ships and armies, and other purposes where the said substances are required to be preserved. Sealed 12th November—6 months for inrolment.

John Ball, of Ashford, in the county of Kent, engineer, for improvements in applying heat to bakers' ovens and their appendages. Sealed 12th November—6 months for inrolment.

Henry Wimshurst, of Limehouse, in the county of Middlesex, ship-builder, for improvements in steam-engines, in propelling, and in the construction of ships and vessels. Sealed 12th November—6 months for inrolment.

Charles Marsden, of Kingsland-road, in the county of Middlesex, engineer, for improvements in scissors and in thimbles. Sealed 12th November—6 months for inrolment.

William Duckworth, of Liverpool, coffee merchant, for certain improvements in the manufacture of chicory, with certain improvements in the machinery or apparatus for the manufacture thereof. Sealed 14th November—6 months for inrolment.

Thomas Shore, of Exwick, in the county of Devon, miller, for an improved method of dressing flour. Sealed 14th November—6 months for inrolment.

Robert Howarth, of 61, Chapman-street, Oldham-road, Manchester, for improvements in machinery for raising a nap on cotton, woollen, silk, and other fabrics. Sealed 14th November—6 months for inrolment.

Abraham Haley, of Frome, in the county of Somerset, machinist, for certain improvements in looms for weaving. Sealed 14th November—6 months for inrolment.

Edward David Ashe, of Brompton, in the county of Middlesex, Lieutenant in Her Majesty's Navy, for a new or improved nautical instrument or instruments, applicable especially, amongst other purposes, to those of great circle sailing. Sealed 14th November—6 months for inrolment.

John Swindells, of the firm of Swindells and Williams, of Manchester, and Ince, near Wigan, manufacturing chemist, for certain improvements in obtaining products from ores and other matters containing metals, and in the preparation and application of several such products, for the purpose of bleaching, printing, dyeing, and color making. Sealed 14th November—6 months for inrolment.

Joseph Conrad Baron Liebhaber, of Paris, in the Republic of France, for improvements in blasting rocks; also in working marble and stone, and in preparing products therefrom. Sealed 14th November—6 months for inrolment.

Charles Allemand, of Paris, in the Republic of France, Gent., for an improved apparatus for producing light. Sealed 14th November—6 months for inrolment.

Thomas Coats, of Ferguslie, in the town of Paisley, and county of Renfrew, Scotland, thread manufacturer, for certain improvements in turning, cutting, and shaping wood and other materials. Sealed 16th November—6 months for inrolment.

Joseph Martin, of Liverpool, in the county of Lancaster, rice-miller, for improvements in machinery and apparatus for cleansing and otherwise treating rice and certain other grains, seeds, and farinaceous substances. Sealed 16th November—6 months for inrolment.

Thomas Allan, of St. Andrew's-square, Edinburgh, printer and publisher of the Caledonian Mercury, for certain improvements in electric telegraphs, and in the application of electric currents for deflecting magnets, or producing electro-magnets. Sealed 16th November—6 months for inrolment.

William Laird, of Liverpool, in the county of Lancaster, merchant, and Edward Alfred Cowper, of Handsworth, in the county of Warwick, engineer, for improvements in machinery for loading and discharging certain descriptions of cargo in ships and other vessels, and in the construction of such vessels. Sealed 19th November—6 months for inrolment.

John Hoskin, of Islington, in the county of Middlesex, engineer, for certain improvements in valves, applicable to pumps; and also in apparatus to regulate the pressure and flow of water or air in and through pipes. Sealed 19th November—6 months for inrolment.

Thomas Dunn, of Windsor Bridge Iron Works, Pendleton, near Manchester, in the county of Lancaster, engineer, for improvements in machinery and apparatus for moving engines and carriages from one line of rails to another, and for turning them; also for compressing certain substances, and for raising

and lowering heavy bodies. Sealed 19th November—6 months for inrolment.

Paul de Tolstoy, of Paris, in the State of France, General in the service of His Majesty the Emperor of Russia, for improvements in dredging machines,—being a communication. Sealed 19th November—6 months for inrolment.

Clement Augustus Kurtz, of Manchester, in the county of Lancaster, practical chemist, for improvements in dyeing,—being a communication. Sealed 19th November—6 months for inrolment.

Alfred Vincent Newton, of 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for an improved composition applicable to the coating of wood, metals, plaster, and other substances which are required to be preserved from decay; which composition may be also employed as a pigment or paint,—being a communication. Sealed 19th November—6 months for inrolment.

Robert Brown, of Liverpool, in the county of Lancaster, plumber and brass-founder, for improvements in and the application of pumps for raising or forcing water. Sealed 19th November—6 months for inrolment.

Henry William Ripley, of Bradford, in the county of York, dyer, for improvements in dressing and finishing piece goods. Sealed 19th November—6 months for inrolment.

John James Greenough, of the Strand, in the county of Middlesex, Gent., for improvements in the construction of chairs, couches, and seats; parts of which improvements are also applicable to various purposes where springs for supporting heavy bodies and resisting sudden and continuous pressure are required,—being a communication. Sealed 21st November—6 months for inrolment.

James Bendall, of Woodbridge, in the county of Suffolk, machinist, for improvements in certain agricultural implements. Sealed 23rd November—6 months for inrolment.

George Shepherd, of Holborn-bars, in the City of London, civil engineer, and Charles Button, of the same place, operative chemist, for certain improvements in the means or appliances used in conveying telegraphic intelligence between different places. Sealed 23rd November—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, in the county of Surrey, Gent., for improvements in the manufacture of woollen and other fabrics. Sealed 23rd November—6 months for inrolment.

John Hamilton, of Princes-square, Glasgow, and John Weems, of Johnstone, in the Kingdom of Scotland, for improvements in warming and ventilating buildings and structures. Sealed 25th November—6 months for inrolment.

CELESTIAL PHENOMENA FOR DECEMBER, 1850.

D.	H.	M.	
1			Clock after the ☉ 10m. 47s.
—			☽ rises 4h. 12m. M.
—			☽ passes mer. 10h. 2m. M.
—			☽ sets 3h. 11m. A.
	5	45	☿ in Aphelion.
3	1	33	♂ in conj. with the ☽ diff. of dec. 4. 45. S.
	5	16	Ecliptic conj. or ● new moon
	10	10	☿ in conj. with the ☽ diff. of dec. 5. 23. S.
4	17	46	♀ in conj. with the ☽ diff. of dec. 4. 26. S.
5			Clock after the ☉ 9m. 11s.
—			☽ rises 9h. 9m. M.
—			☽ passes mer. 1h. 23m. A.
—			☽ sets 5h. 34m. A.
6			♃ greatest hel. lat. N.
8	14	58	♃'s first sat. will im.
	23	0	☽ in Apogee
10			Clock after the ☉
—			☽ rises
—			☽ passes mer.
—			☽ sets
	12	49	♀ in the ascending node
11			Juno in Aphelion
	8	37	☽ in □ or first quarter
	12	49	☿ in conj. with ♀ diff. of dec. 2. 9. S.
13	7	7	♄ in conj. with the ☽ diff. of dec. 2. 19. N.
14	5		♅ in conj. with the ☽ diff. of dec. 4. 50. N.
15			Mercury R. A. 18h. 11m. dec. 25. 29. S.
—			Venus R. A. 17h. 38m. dec. 22. 12. S.
—			Mars R. A. 17h. 10m. dec. 23. 29. S.
—			Vesta, R. A., 14h. 35m. dec. 9. 24. S.
—			Juno, R. A., 16h. 3m. dec. 11. 17. S.
—			Pallas, R. A., 21h. 53m. dec. 7. 11. S.
—			Ceres R. A. 0h. 8m. dec. 10. 28. S.
—			Jupiter R. A. 13h. 11m. dec. 6. 15. S.
—			Saturn R. A. 0h. 56m. dec. 3. 11. N.
—			Georg. R. A. 1h. 39m. dec. 9. 44. N.
15			Mercury passes mer. 0h. 36m.
—			Venus passes mer. Noon.
—			Mars passes mer. 23h. 50m.
—			Jupiter passes mer. 19h. 33m.
—			Saturn passes mer. 7h. 19m.
—			Georg. passes mer. 8h. 3m.
—			Clock after the ☉ 4m. 38s.
—			☽ rises 2h. 5m. A.
—			☽ passes mer. 9h. 1m. A
—			☽ sets 2h. 58m. M.
—			Occul. B.A.C. 845, im. 8h. 20m. em. 9h. 10m.
	16	21	♃'s first sat will im.
16	4	2	♀ in inf. conj. with the ☉
	—		Occul. ƒ Tauri, im. 3h. 54m. em. 4h. 48m.
	17	5	♃'s second sat. will im.
17			Occul. 75 Tauri, im. 4h. 33m. em. 5h. 28m.
	22	30	♄ stationery
18			Occul. χ^2 Orionis, im. 17h. 25m. em. 17h. 51m.
19	5	3	Ecliptic oppo. or ○ full moon
	21	20	♀ in conj. with ♂ diff. of dec. 2. 57. S.
20			Clock after the ☉ 2m. 11s.
—			☽ rises 5h. 38m. A.
—			☽ passes mer. 0h. 46m. M.
—			☽ sets 3h. 56m. M.
	13	57	♃'s third sat. will im.
	16	38	♃'s third sat. will em.
21	15	38	☉ enters Capri., Winter com.
	16	8	☿ greatest hel. lat. S.
	18		☽ in Perigee
	20	12	Ceres in □ with the ☉
22	18	45	♃'s first sat. will im.
23	19	38	♃'s second sat. will im.
25			Clock before the ☉ 0m. 18s.
—			☽ rises Morn.
—			☽ passes mer. 5h. 33m. M.
—			☽ sets 0h. 6m. A.
	9	24	☽ in □ or last quarter
26			Occul. 80 Virginis, im. 15h. 56m. em. 16h. 27m.
	11	46	♃ in conj. with the ☽ diff. of dec. 4. 1. S.
27	17	54	♃'s third sat. will im.
30	23	58	♀ in conj. with the ☽ diff. of dec. 0. 36. N.
31	6	21	☉ in Perigee
	15	6	♃'s first. sat. will im.

J. LEWTHWAITE, Rotherhithe.

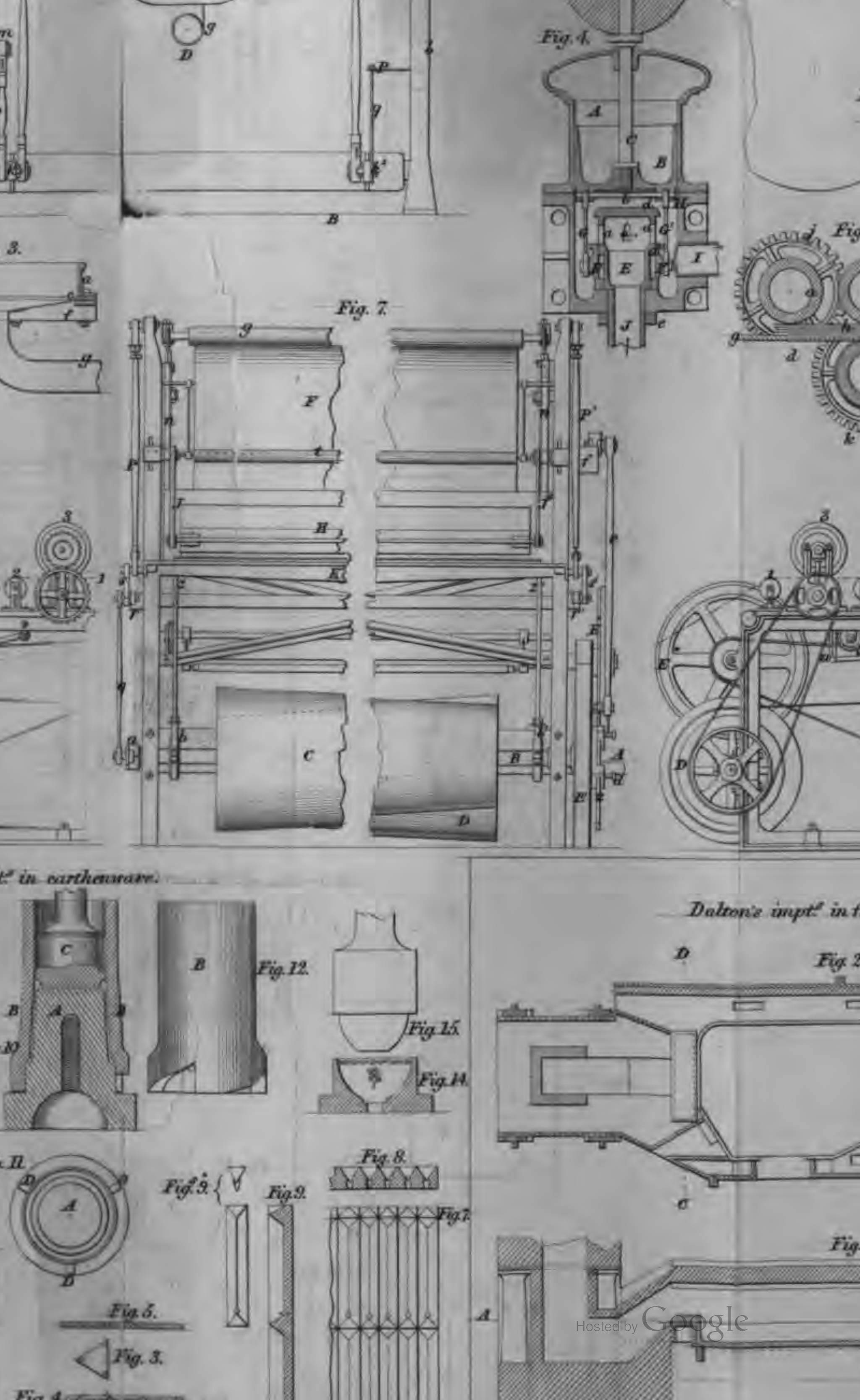
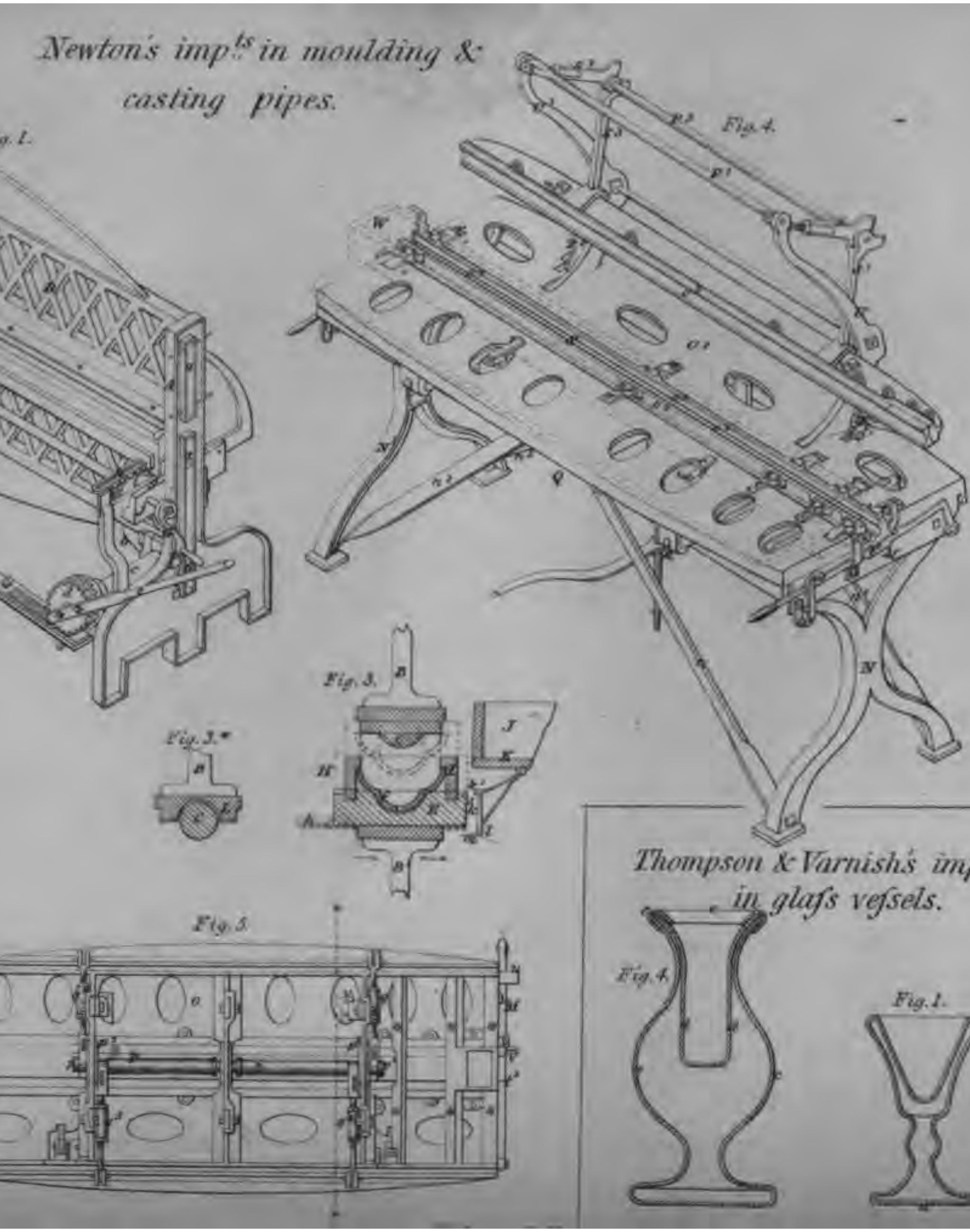
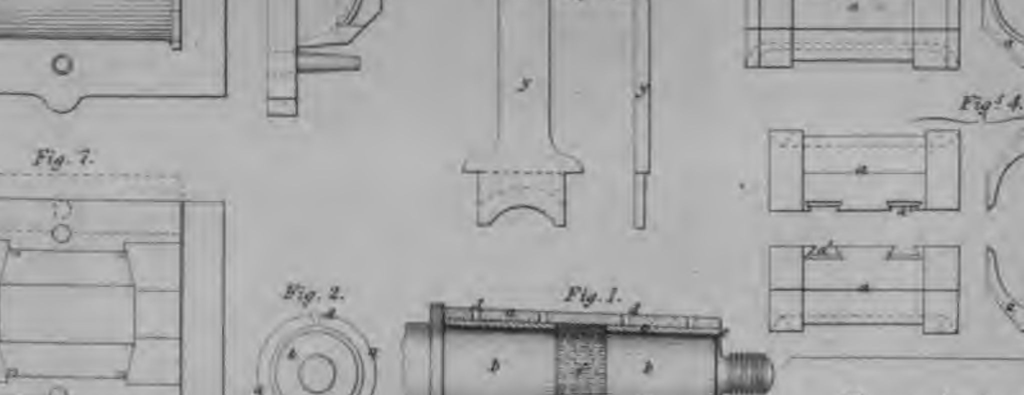
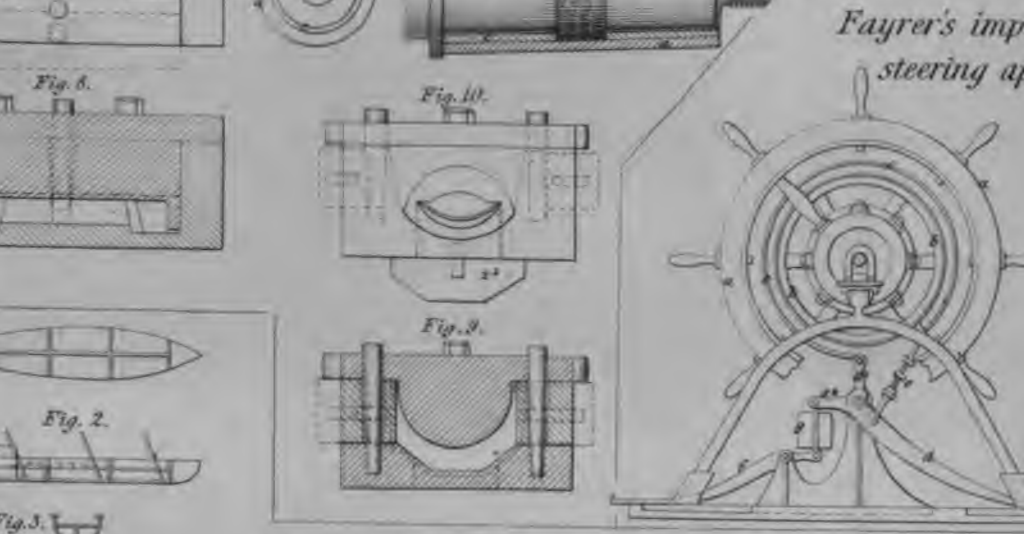


Fig. 4.
Fig. 7.
...t.^e in earthenware.
Fig. 12.
Fig. 15.
Fig. 14.
Dalton's impt.^e in t...
Fig. 2
Fig. 8.
Fig. 9.
Fig. 7.
Fig. 5.
Fig. 3.
Fig. 11

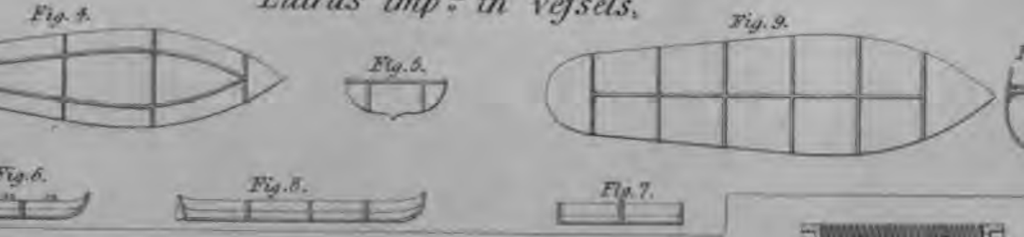

Newton's impts in moulding & casting pipes.
Fig. 1.
Fig. 4.
Fig. 3.
Fig. 3.*
Fig. 5.
Thompson & Varnish's imp
in glass vessels.
Fig. 4.
Fig. 1.



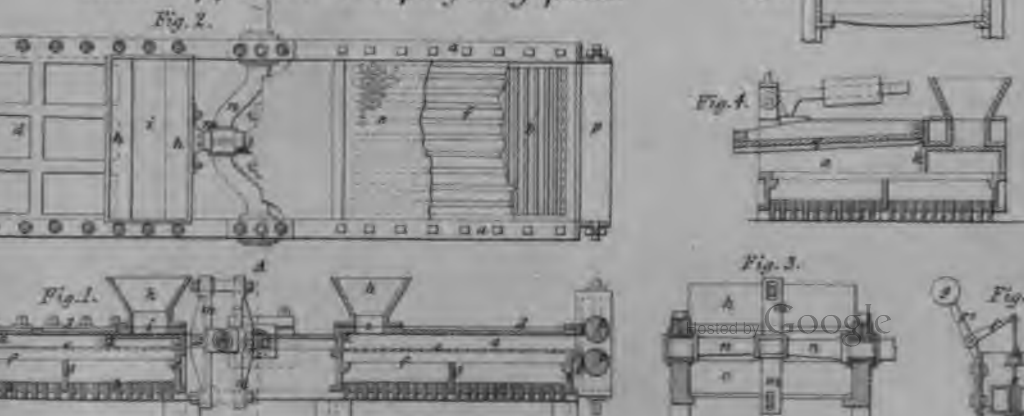
Fayrer's imp
steering ap

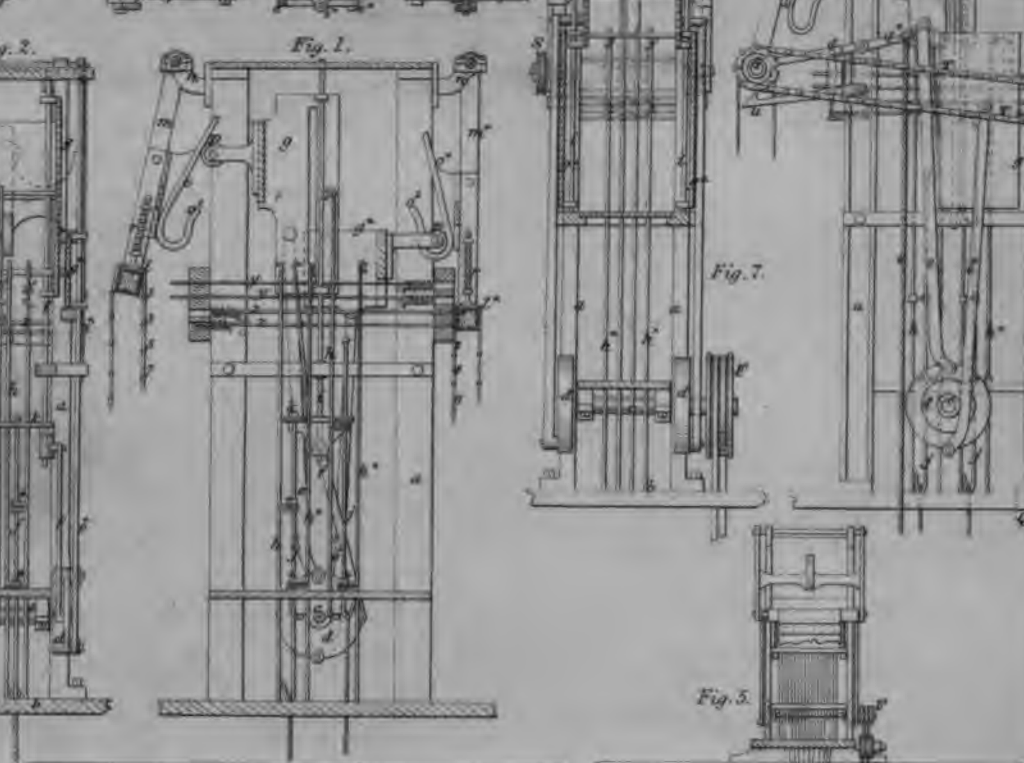


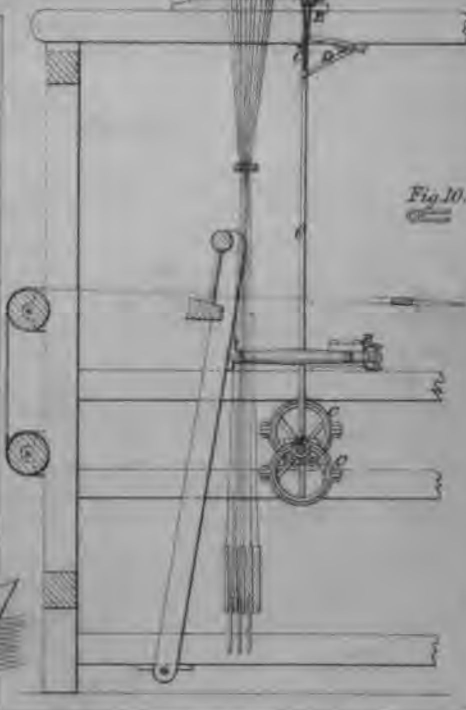
Laird's imp^{ts} in vefsels.



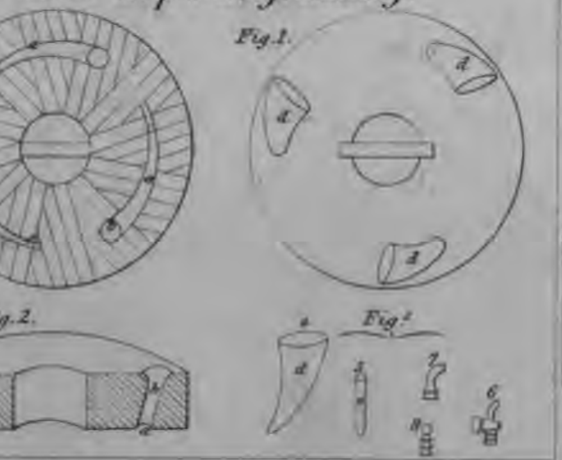
Hills' app^{ts} for compreſsing peat.



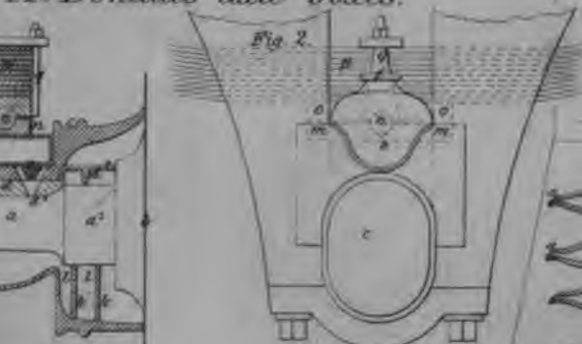




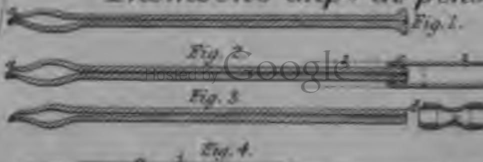
Walck's imp^ts in grinding.



M^c Donald's axle boxes.



Thomson's imp^ts in pens



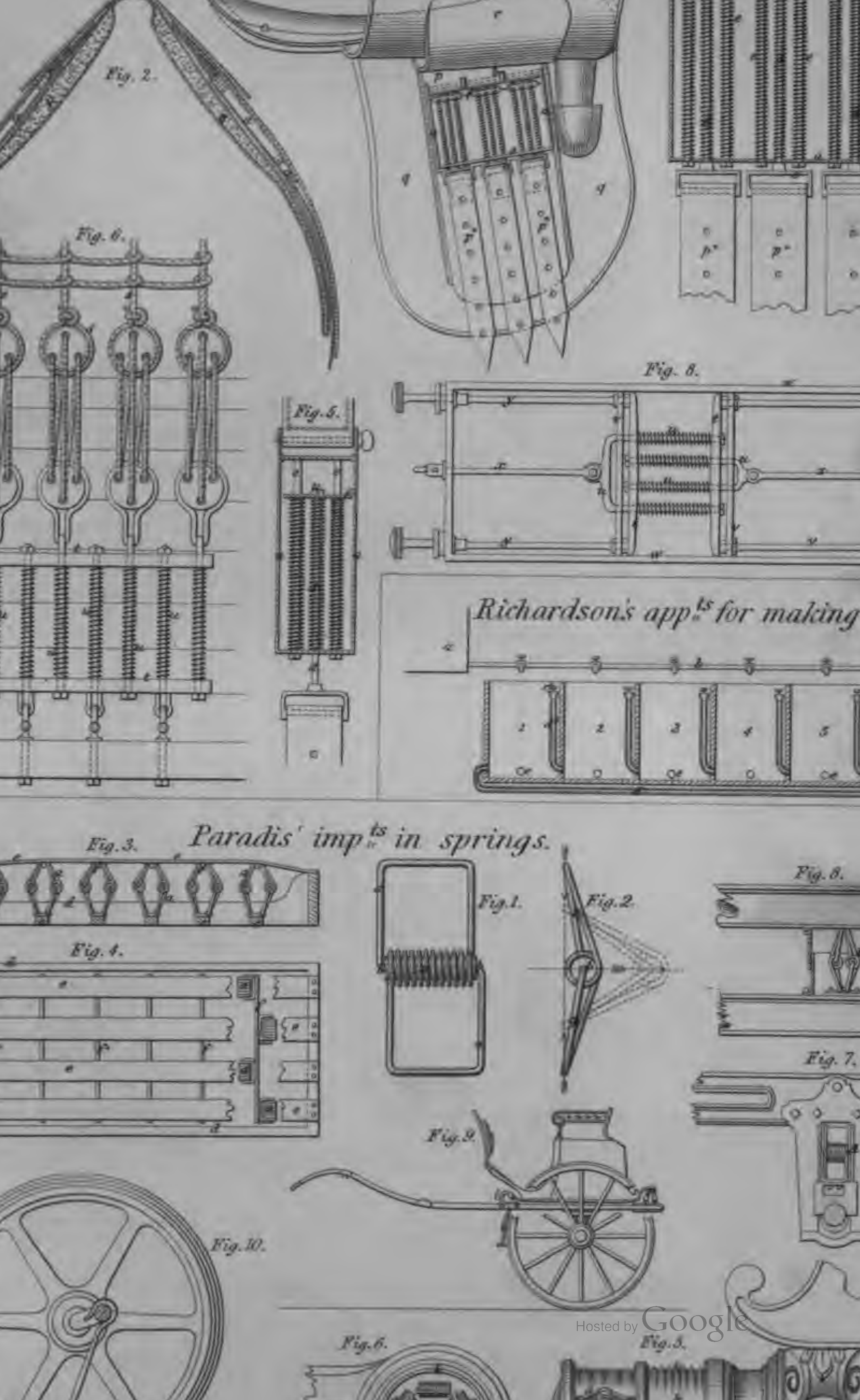
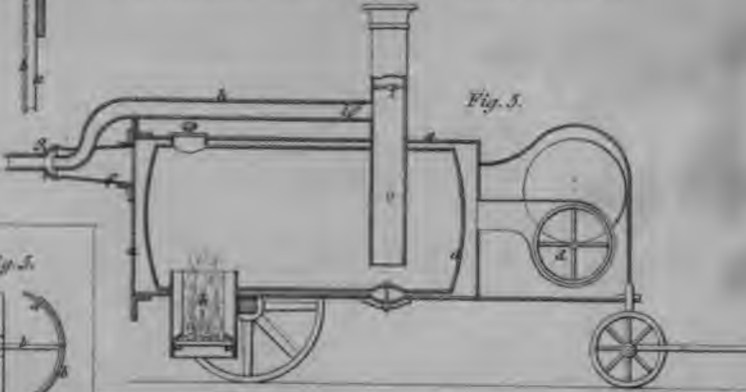
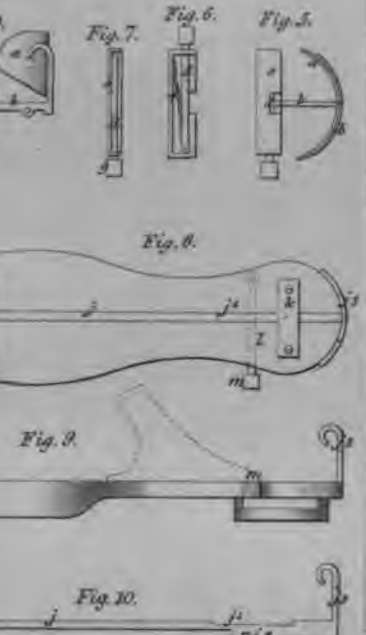


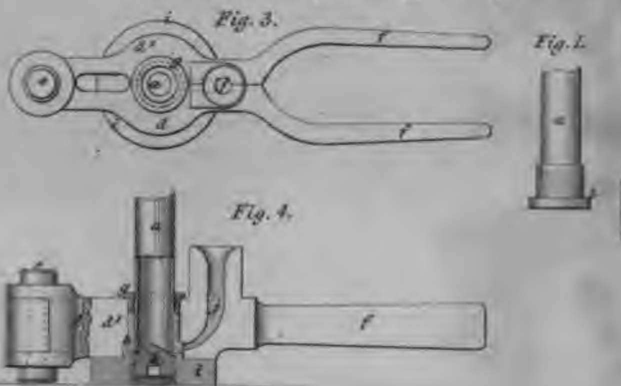
Fig. 2.
Fig. 6.
Fig. 5.
Fig. 8.
Richardson's app.ts for making
Paradis' imp.ts in springs.
Fig. 3.
Fig. 4.
Fig. 1.
Fig. 2.
Fig. 8.
Fig. 7.
Fig. 9.
Fig. 10.
Fig. 6.
Fig. 5.

Grantham's imp^ts in sheathing ships.

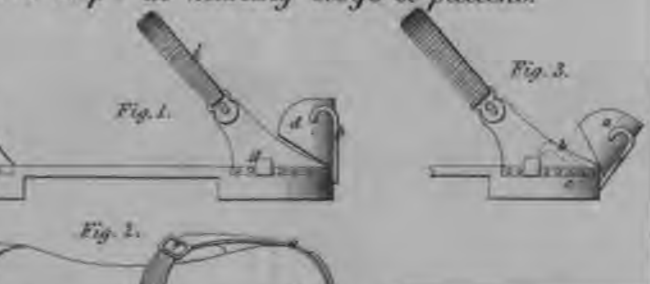




Mayo's imp^ts in joining tubes.

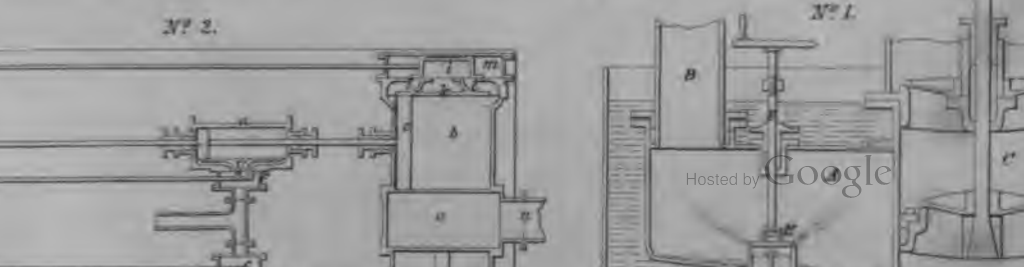


...rts' imp^ts in making clogs & pattens.



Scoffern's imp^d va...

Diagrams illustrating Mechanical...
Engineers' Transactions.



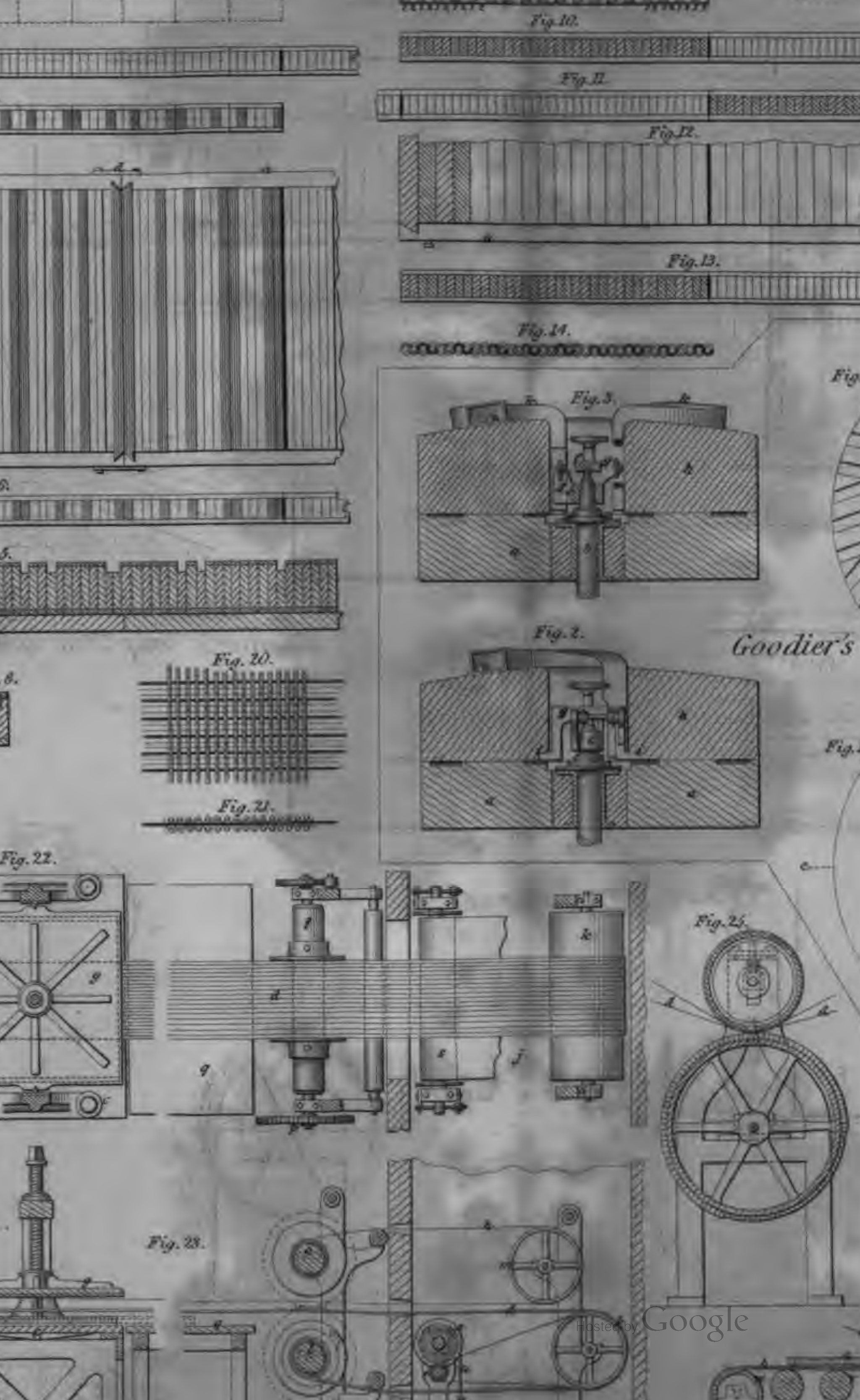


Fig.10.
Fig.11.
Fig.12.
Fig.13.
Fig.14.
Fig.3.
Fig.2.
Goodier's
Fig.20.
Fig.21.
Fig.22.
Fig.23.
Fig.24.

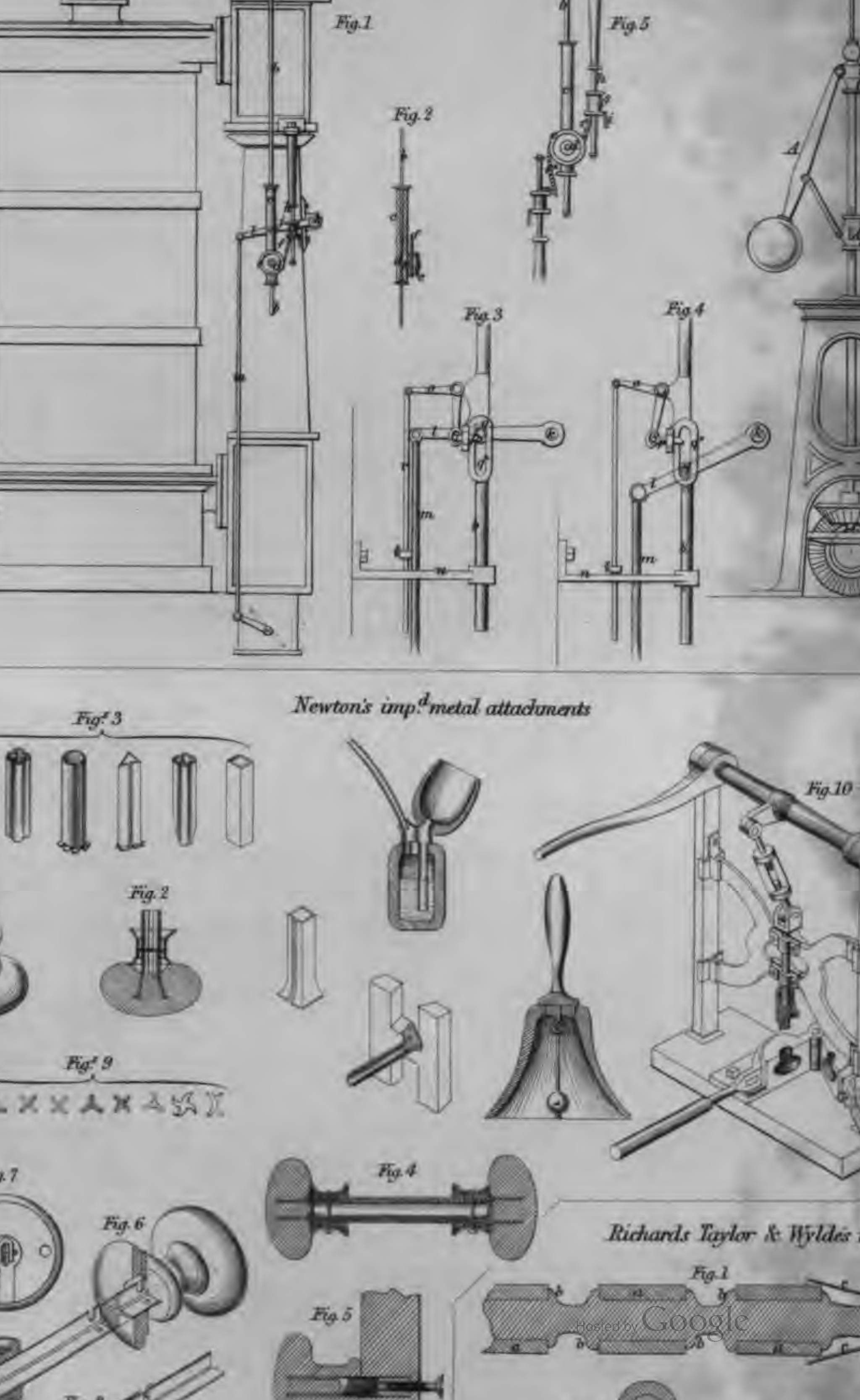
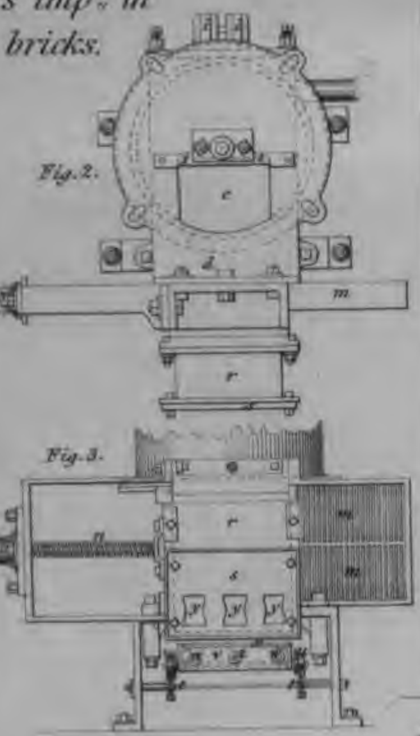
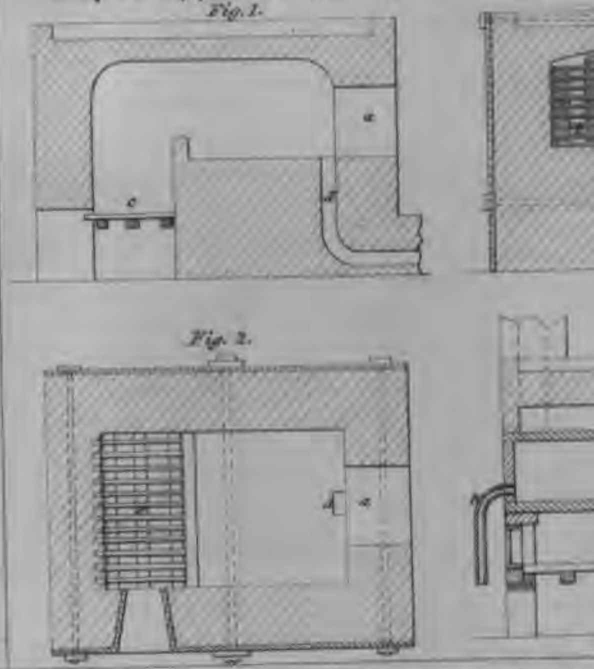


Fig. 1
Fig. 2
Fig. 5
Fig. 3
Fig. 4
Newton's imp.d metal attachments
Fig.s 3
Fig. 2
Fig. 10
Fig.s 9
Fig. 4
Fig. 6
Fig. 5
Richards Taylor & Wylde's
Fig. 1

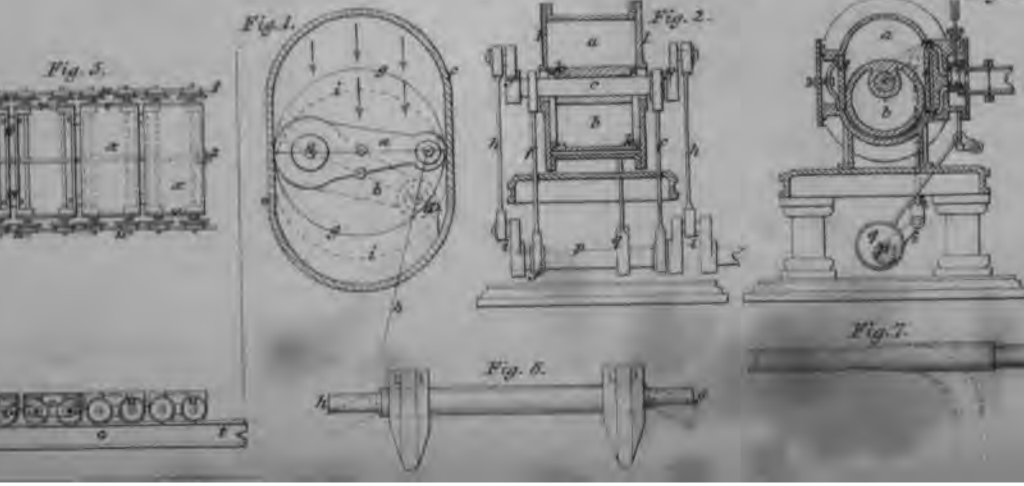
's imp^{ts} in
bricks.

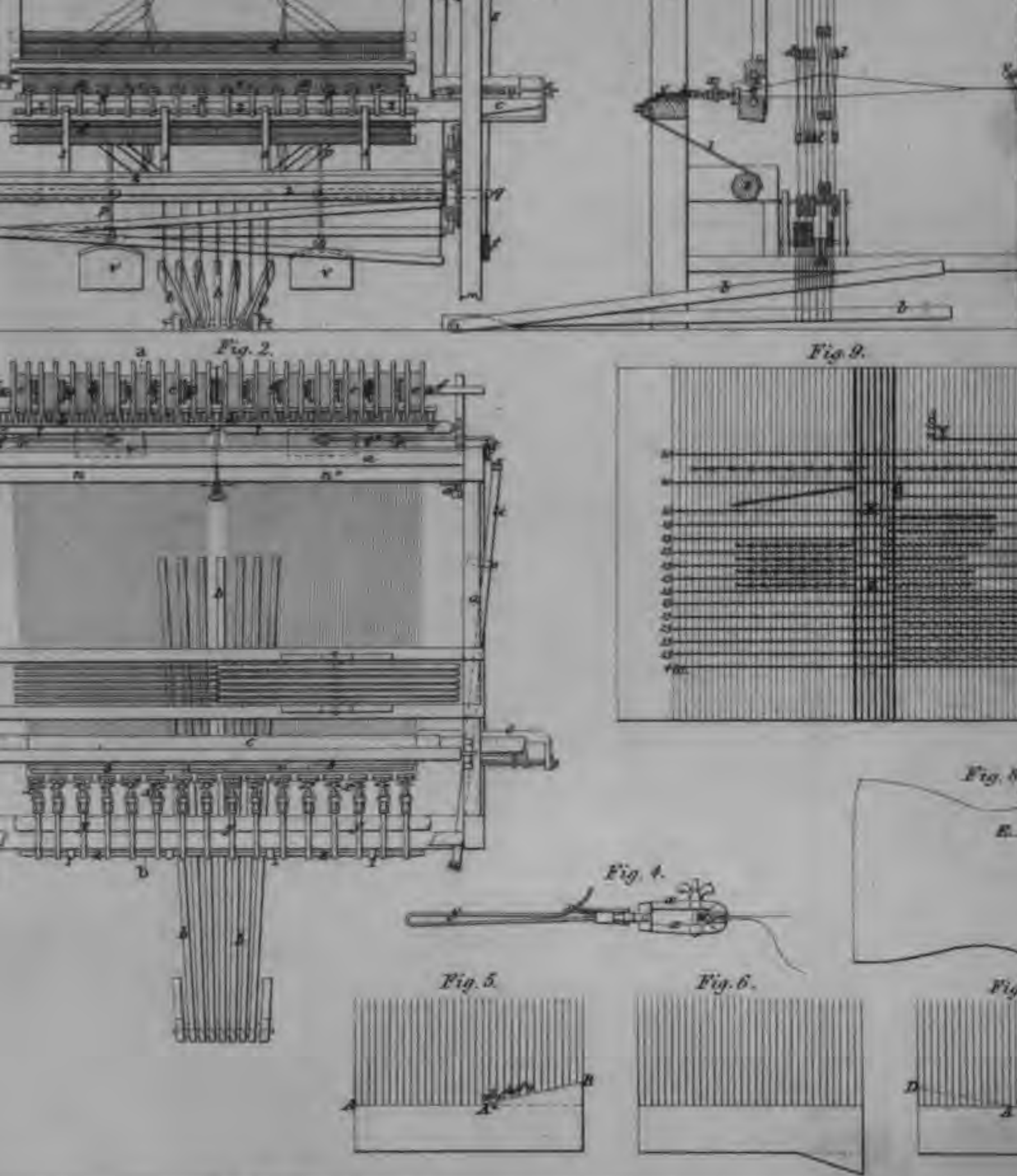


Riepe's app^{ts} for manufacturing ste

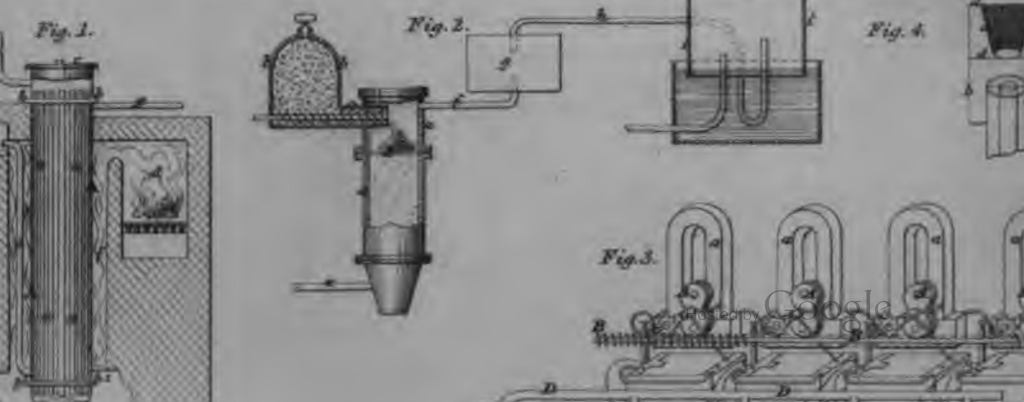


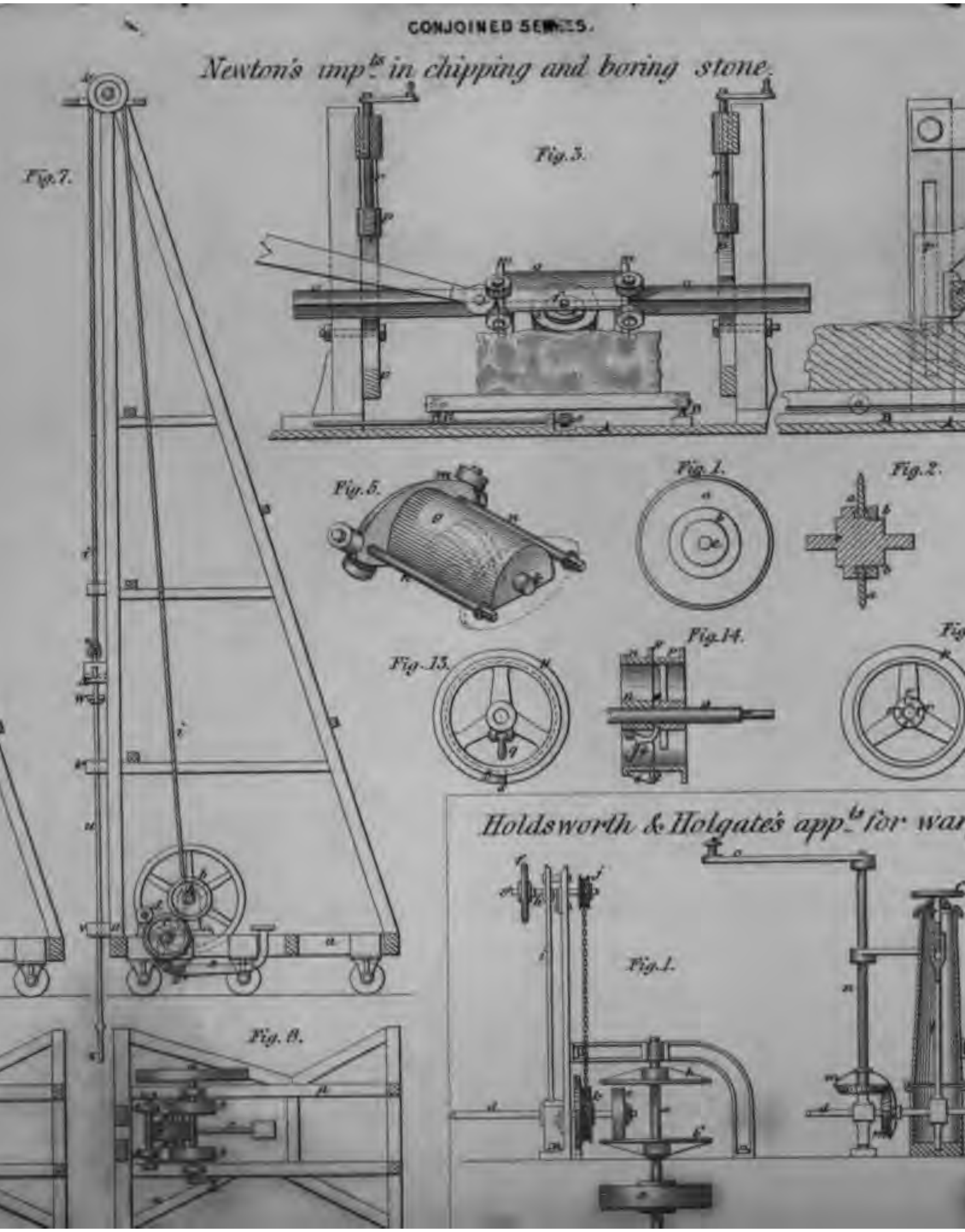
Diagrams illustrating Mechanical Eng





Gillard's imp^{ts} in obtaining hydrogen gas.




CONJOINED SERIES.
Newton's imp^ts in chipping and boring stone.
Fig. 3.
Fig. 7.
Fig. 5.
Fig. 1.
Fig. 2.
Fig. 13.
Fig. 14.
Fig. 8.
Holdsworth & Holgate's app^ts for war
Fig. 1.

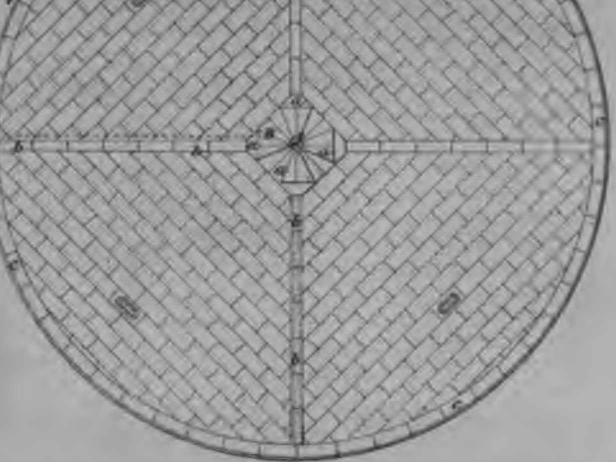
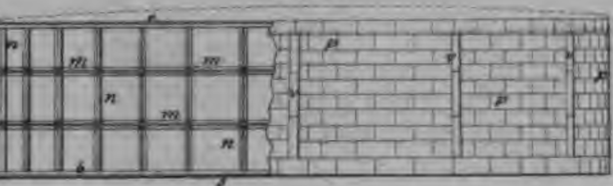


Fig. 2.

Fig. 3.



Wilson's imp.d venti

Fig. 1.

Fig. 3.

Newton's coupling

Fig. 1.

Fig. 2.

Preece's app.ts for driving mach.y

Fig. 1.

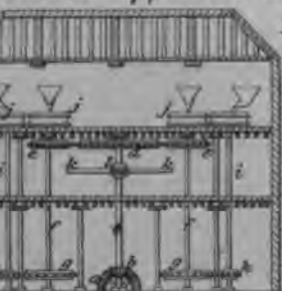


Fig. 2.

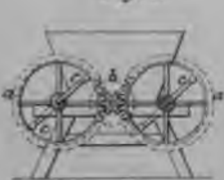
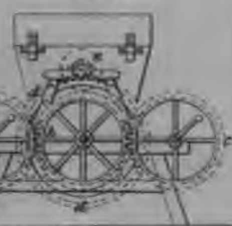


Fig. 3.



Clenchard's imp.ts in dyeing.

Fig. 1.

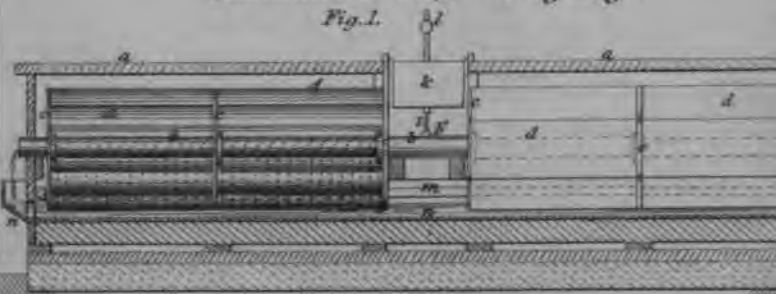
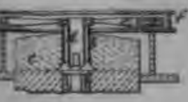


Fig. 4.

Fig. 2.

Fig. 3.

's imp.d mill.



Ross' impd. linting machine.

Fig. 2.

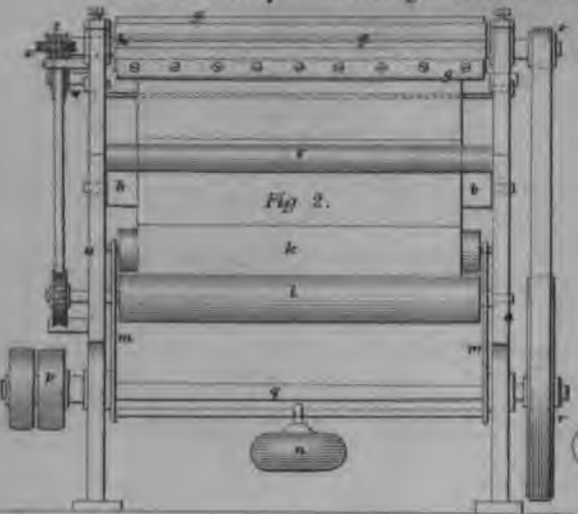


Fig. 3.

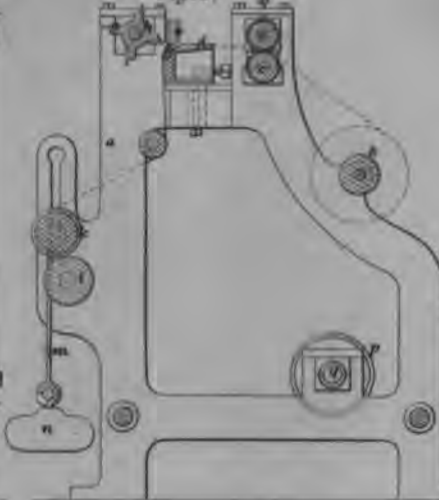


Fig. 7.

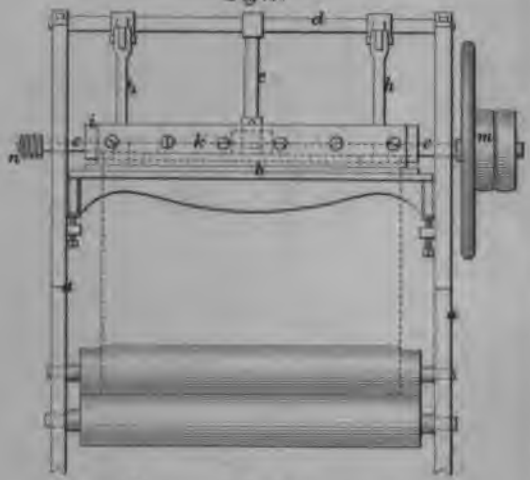


Fig. 8.

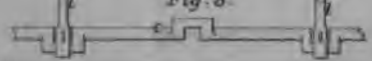
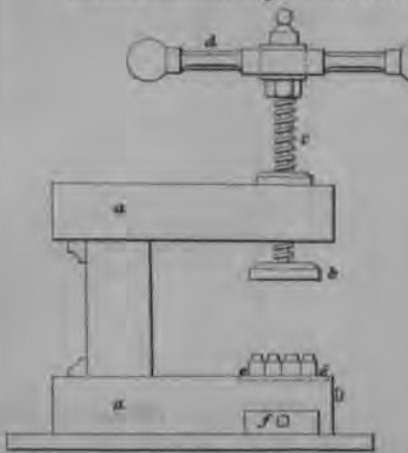


Fig. 9.

Fontainmoreaus appts. fo manufacturing wafers.



Robbins' imp.ts in railway carriages

Fig. 1.

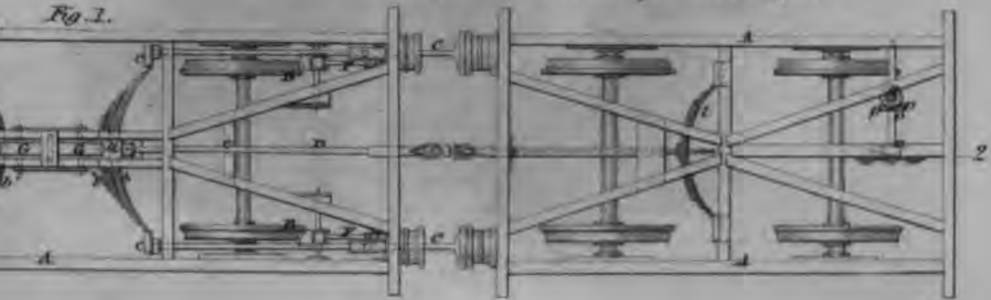
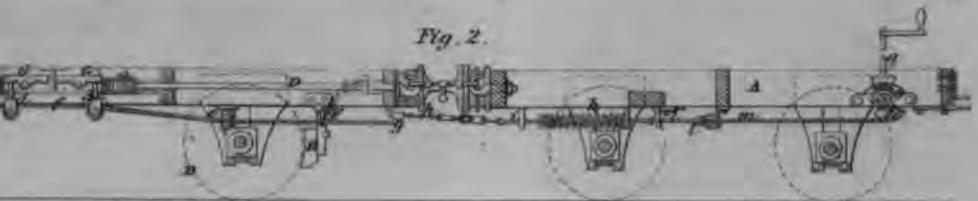


Fig. 2.



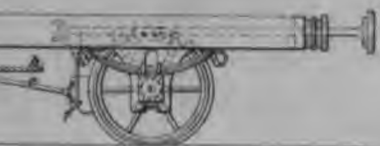
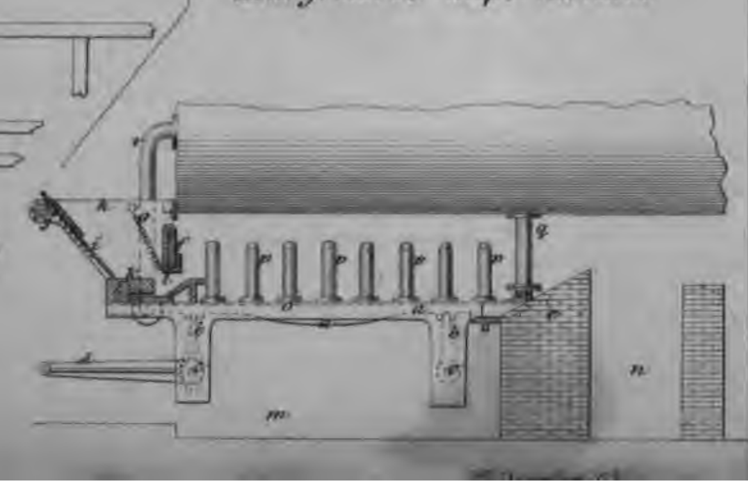
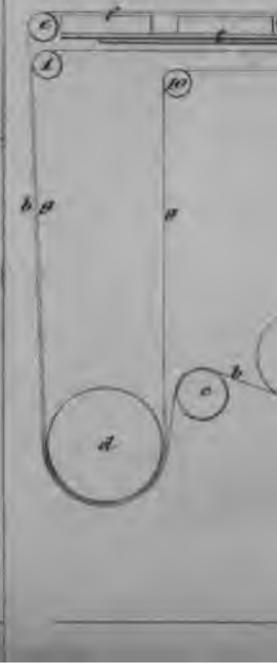


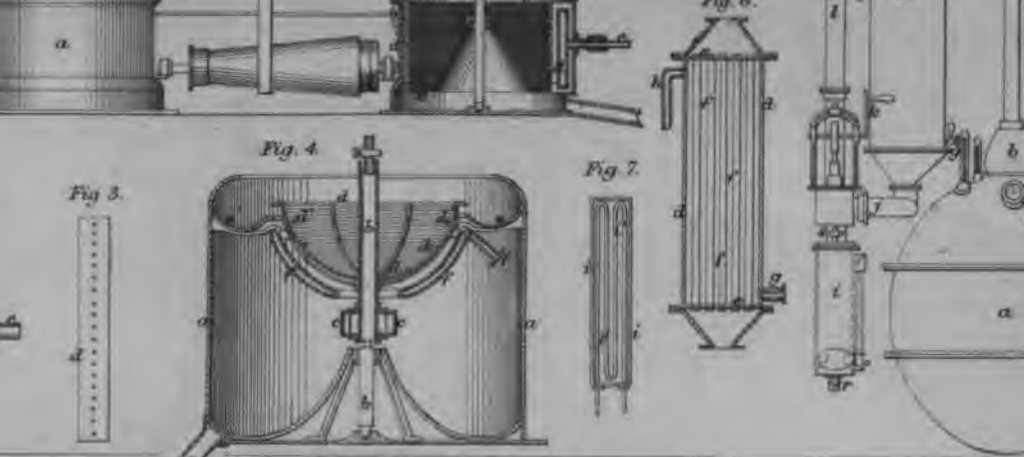
Fig. 5.

Hargreave's imp.d furnace

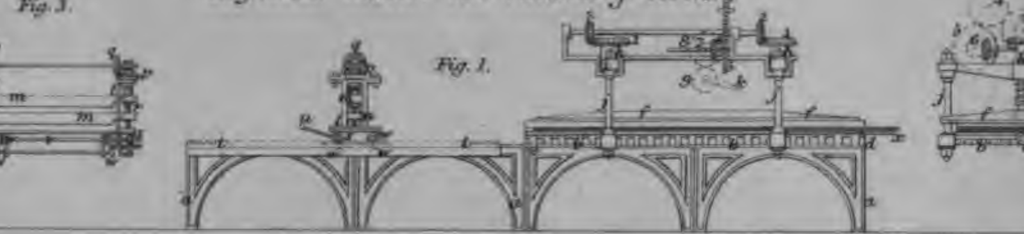


Dalglish's

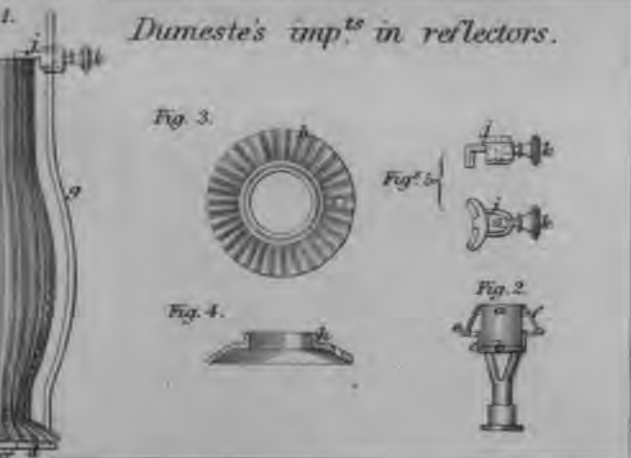




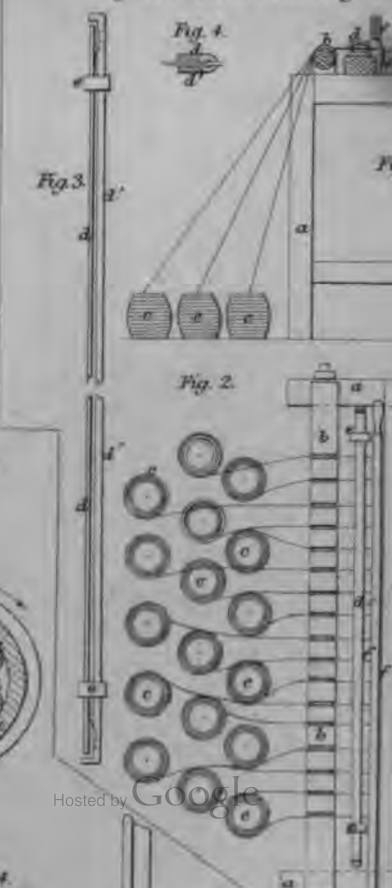
Heycock's mach.y for finishing cloth.



Dumeste's imp.ts in reflectors.



Sykes' wick-cutting m



Diagrams Illustrating Mechanical Engineers transactions.